

The Mining Journal

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Railway & Commercial Gazette

Vol. CCXXXIX No. 6111

LONDON, OCTOBER 3, 1952

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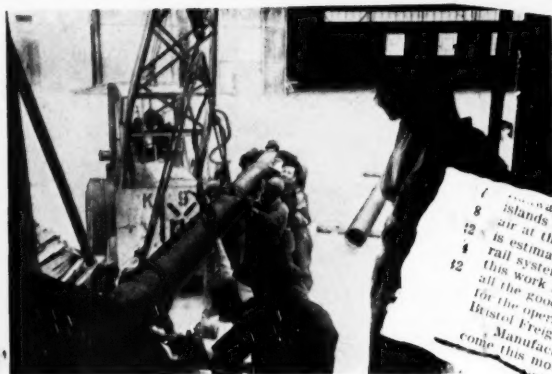
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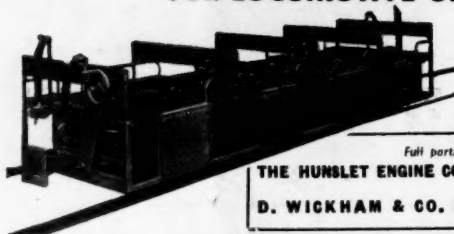
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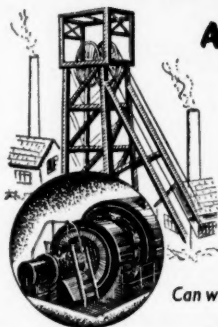
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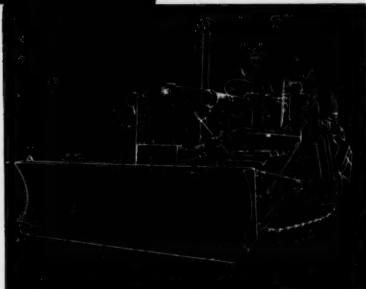


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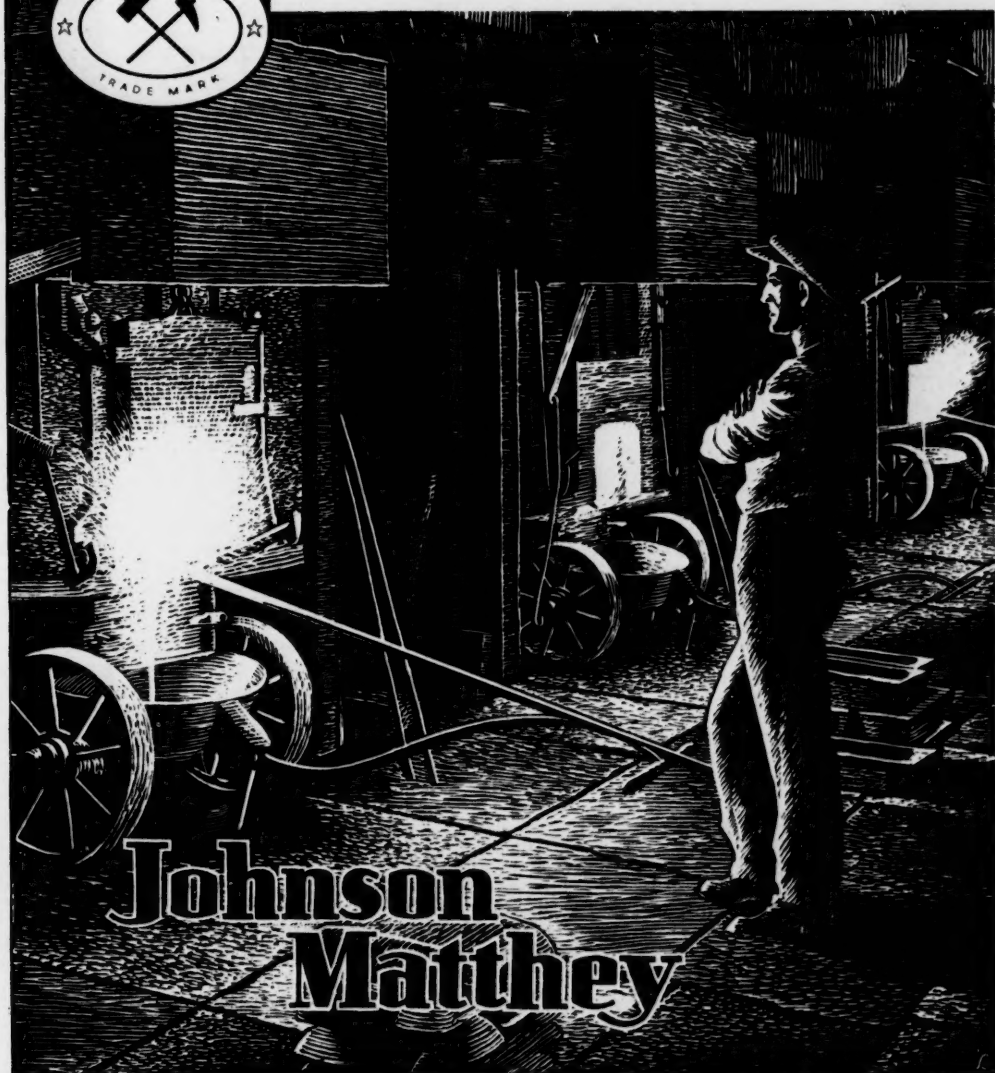
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NOTES AND COMMENTS

The London Metal Exchange Resumes Lead Dealings

Resumption of lead dealings on the London Metal Exchange last Wednesday after an interval of thirteen years was characterized by an unexpectedly large turnover at a price £8 below the current Continental free market price, and nearly £25 below the controlled Ministry of Materials price. During the day 4,300 tons changed hands and at the close October and January lead was being quoted at about £107. A considerable amount of prompt metal was offered, both from Empire and American sources, suggesting that producers have been shipping to the U.K. in anticipation of the Exchange re-opening.

With lead readily on offer, it is not surprising that the Government broker was not a heavy seller, as the Ministry of Materials has already made it clear that it does not intend at present to release more lead to the market than is needed to enable the Exchange to function smoothly. With something like 100,000 tons of Government lead in stock in this country, dealings by the Government broker seem likely to be spread over a considerable period, unless, as may well be the case, the Government decides to take a considerable proportion of this off the market for stockpiling or selling to the American government.

If the London price remains at or below its present level, there will be scope for arbitrage operations, provision for which is reported as having been made from Britain's dollar pool. Lead at £107 a ton is equivalent to about 13½c. per lb. to which must be added about 2c. for import duty, shipping and other charges, bringing the delivered New York price to about 15½c.

Looking further ahead the governing factor in the market appears to be the extent to which the U.S. administration is prepared to support the market at a 16c. level by stockpile buying. As reported elsewhere in this issue the G.S.A. is believed to have bought about 30,000 tons for the stockpile in the last few days while a previous purchasing programme for a similar amount for its "civilian" stockpile, was completed last month. Some authoritative London observers are anticipating a surplus of about 200,000 tons of U.S. consumption over domestic production plus imports of new metal so there is clearly scope for considerable further stockpiling operations. If the administration accepts the conclusions of the Paley Report regard-

ing the inherent shortage of lead in the long-term picture, it may well regard the present world price level as a satisfactory one at which to advance its stockpile programme as rapidly as possible.

Meanwhile all those who have been working towards the re-opening of lead dealings on the London Metal Exchange must be viewing the first day's business with considerable satisfaction, while lead users are, for the first time for many a day, finding themselves at a buying advantage vis-a-vis their Continental and American competitors. There is no doubt that since the announcement in August that lead dealings would be resumed, consumers have been holding off buying from the Ministry in anticipation of Metal Exchange dealings re-opening well below the controlled price and it remains to be seen in the next week or so what effect these deferred orders may have on the market.

Progress in Hydraulics Research

The second annual conference of the British Hydro-mechanics Research Association was held at Cambridge from September 23 to 28. During the same period two open days were held at the Association's establishment at Harlow, Essex, where visitors were given an insight into the work in progress. The wide field covered by the Association's activities was illustrated by 15 exhibits, many of which were of direct or indirect importance to the mining industry.

The object of one investigation is to determine the effect of particle size, shape, density, and head and pipe diameter on the velocity required to transport various concentrations of solids. This information is primarily required in order to estimate the economic possibilities of hydraulic transport of minerals in bulk. Owing to the need to measure the particle size of the solids used in the transport experiments, a 15 ft. vertical glass pipe has been erected in order to determine their settling velocities. The size variation of the sample is obtained by continuous weighing of the solids as they reach the bottom and fall on to a scale pan.

Other exhibits were devoted to centrifugal pump inlet conditions, the observation of flow in centrifugal pump impellers, pipe friction, pressure surges, natural oscillation in a discharge tank, seals and gland packings, etc.

In addition to the normal research work there is an increasing demand for special investigations to be undertaken for individual members, among whom are most eligible companies in the pump industry. From about a quarter of the queries received the necessary information for a satisfactory reply does not exist, realistic indications for future research being thus provided.

The Library and Information Service has been expanded in the past few months. An Abstract Bulletin is published by the association every two months and to date about 1,200 abstracts have been made, covering published material from a large number of countries.

Base Metals in Yugoslavia

Before the World War, Yugoslavia was achieving a widely recognized importance as a producer of copper, lead and zinc through the medium principally of the Bor Copper and the Trepcia, Novo Brdo, Kopaonik and other lead and zinc mines. Statistical information regarding production available during and since the war has been very scrappy and a recent statement in the Yugoslav Chamber of Commerce organ gives us welcome data of the current situation. The Bor Copper Mines, originally a French company since nationalized, suffered severely under Nazi exploitation as may be seen from the lowering of the grade of the tonnage treated. This was 5.2 per cent Cu. in 1939 and fell to 3.03 last year. As a result, despite a larger tonnage of ore extracted, production fell from 54,107 tonnes in 1939 to 46,015 last year. A certain amount of gold is also recovered as a by-product, recovery being 2.1 grammes per ton of ore.

The domestic consumption of the industrial metals in the country is steadily on the increase and while home consumption of copper is put at around 19,000 tonnes, with the completion of a copper rolling mill at Sevojna and a cable factory in Svetozarevo is expected to reach some 43,000 tonnes in the future. As copper exports are an important element in the external commerce of the country, enlarged production in the future is seen as a necessity. To effect this, recent discoveries of copper ore in the old mining centre of Majdanpek are timely. Here the reserves have been delimited at around 100,000,000 tonnes of ore, but the grade is comparable only to that now generally accepted in the United States as economic being placed at 0.9 per cent Cu. They are favourably situated for surface exploitation and it is estimated that an annual production of 45,000/50,000 tonnes should be possible for a period of 25-30 years.

Since Roman times what is now Yugoslavia has been an important producer of lead-zinc ores. All the mines now operating are said to be based on, or connected with ancient mining operations. Previous to the war, lead production was steadily rising and in 1938 exports of concentrates amounted to 88,983 tonnes and of metal 5,550 tonnes, this being the last year for which we have figures. As regards zinc, in 1939 the Stantrg mine produced 53,182 tonnes of zinc concentrates, the Kopaonik mine not then having reached the producing state. Last year, 56,500 tonnes were exported, so that the pre-war position has been practically recovered.

Yugoslavia is well supplied with lead smelting plant, and with the enlargement of the Trepcia smelter, this is described as the largest of its kind in Europe. Such, however, is far from being the case at the present time, when capacity would appear to be about 40,000 tonnes. Later, it is hoped that this may be raised to 60,000/70,000 tonnes when the enlargement of the smelter is completed. The Mezice plant has also been modernized and has a capacity of some 15,000 tonnes. Thus, on the basis of Yugoslavian expectations, there will eventually be available a capacity

of 75,000/85,000 tonnes a year enabling more concentrates to be reduced to metal in the country.

Even allowing for increased home consumption, Yugoslavia should be able to export some 60,000 tonnes of lead annually, it is estimated.

In regard to zinc, the capacity of the Celje zinc smelter has been doubled since 1947, and has an estimated annual capacity of 16,000 tonnes. In addition an electrolytic plant is under construction at Sabac scheduled to produce 12,000 tonnes of electrolytic metal. Together the combined capacity of the zinc smelters should be in excess of 25,000 tonnes of metal, and an eventual export of about 8,000 tonnes is anticipated. Some silver is also recovered in the lead smelter, but as no figures are advanced it is difficult to credit the statement that the country is the largest producer in Europe. Anyhow, there is more than sufficient for domestic needs and exports are said to amount currently to about 46 tonnes or, say, 193,000 oz.

Economic Mineral Surveys in S. Rhodesia in 1951

Reports from overseas dominion and colonial territories and protectorates increasingly reflect the stimulus to their geological surveys particularly on the mining economic side, which has resulted from the world wide demand for scarce or strategic minerals. A recent one to reach us is that of the Director of the Geological Survey for Southern Rhodesia, a corps which now comprises the Director himself, Mr. J. C. Ferguson, and eight subordinates. He says that last year the four senior members of the field staff were mainly occupied on mining geology and work of a directly economic nature—no geologist having been detailed solely for economic work during the period 1934-1946 except for special assignments during the war. The most important task appears to have been the thorough investigation of the coal deposits in the Wankie district, comprising the Entuba and Lukosi areas. As in the latter locality no coal of economic value was found, the drills were moved back to Entuba to continue the promising results obtained in 1950. Up to the end of November last, when work was suspended owing to the exhaustion of the funds allocated, 125,000,000 tons of which 61,300,000 tons of very good quality coal had been proved, while over a large area 366,900,000 tons of which 130,000,000 tons of good quality were estimated. The results of a thorough drilling of the Lubimbi coalfield in Sengwe are also described as good. Drilling for iron ore revealed a further addition of 8,000,000 tons to the previous estimate of 2,000,000 tons in the Que Que district, to which may be added 2,000,000 tons of limestone.

While in the examination of mines and prospects coal naturally secured the largest proportion of the field staffs' time, antimony, asbestos, pyrites, beryl, chrome, copper, diamonds, feldspar, kyanite, mica, phosphorus, tungsten minerals, uranium and vermiculite all received attention.

Ten gold mines operated under the Mining Settlement scheme in Matabeleland and were examined by Mr. E. H. Phaup, and Dr. Amm reported promising results on the Mamba and Hepworth mines where reefs carrying good values were re-located beyond faults.

The mineralogical branch of the survey reported an increased intensification of prospecting for base minerals, more particularly cassiterite, tantalite, scheelite and beryl, and a number of occurrences of economic minerals were reported from entirely new localities. The use of the fluorescent lamp greatly facilitated prospecting for scheelite.

That there is still a big field to be covered by the Geological survey of Southern Rhodesia is indicated by the fact that detailed and geological mapping so far has extended over only 16 per cent of the territory embracing about 150,000 sq. miles.

Salients in Congo Mining in 1951

Correspondence published from our Belgian Correspondent during the last few months has generally emphasized aspects of mining production and development in the different regions of the Belgian Congo, or has focused attention on a specific company or group of companies operating in any one particular region. For example, in our issue of June 27, he described the impressive advances made in the important Katanga region in the production of copper and cobalt, while in a note appearing in our issue of July 18 he referred to the diamond prospects worked by Forminière in the Kasai River Basin. In *The Mining Journal* of May 30 last, statistics were presented of the whole range of minerals mined in the Belgian Congo during 1949-1951, and in the following article our correspondent amplifies these previous notes by presenting the mine statistics of the region, supplied from the report by M. A. Vaes, Director of the Mines Bureau, which indicate the salient points of mining enterprise to take place in the Belgian Congo fields during last year.

In continuation of the mine statistics of the Belgian Congo and Ruanda-Urundi published in *The Mining Journal* of May 30 last, the Governor-General of the Congo, M. Pétillon, has kindly supplied your correspondent with a copy of an extensive report by the Director of the Mines Bureau, M. A. Vaes, from which the following details are taken:

Output improved chiefly in Katanga—the south-eastern portion of the Colony. Reckoning 1950 production at 100; in 1951 copper production represented 109; cobalt metal 111; roasted zinc concentrates 108; crude concentrates 117; and coal 136. In tin concentrates and those of its associated metals the increase in production was less.

This development is due primarily to the following causes:

1. The existence in Katanga of important primary fields, which have been methodically inventoried and systematically studied.
2. The creation of sources of cheap power.
3. The most developed technical equipment of the mines and of the plants treating the ores and metals.
4. The improvement of transport media.
5. The organization of native labour.
6. The technical and financial capacities of the powerful companies operating the Katanga mines.

PRODUCTION OF CASSITERITE

Cassiterite is mainly the product of the eastern part of the Congo where general conditions are not so favourable as in Katanga. Indeed, it was only after 1930 that Maniéma and Kivu were opened to mining enterprises. Consequently prospecting and development are only in their initial stages; transport and power have still to be much improved. The output of cassiterite in 1951 was 17,572 tonnes as against 17,546 for 1950 and 24,061 in the peak year of war production, 1945. The regression in production has been due to re-organisation of methods of working which are not yet completed. As soon as this is achieved Géomines production will develop appreciably. Early in 1952 a contract was signed between the representatives of the U.S. Government and the Belgian Congo tin producers. This two-year contract provides that more than half the output is sold at a reasonable price somewhat above the Frs. B.135 per kilo for metal. This premium is to stimulate production.

A production of 3,059 tonnes of ingot tin was secured by Géomines from its smelter at Manano, partly from its own ores and partly from those of Georuanda and Sermikat but most of the cassiterite is shipped to Belgium to be smelted there.

The production of mixed cassiterite-tantalum-columbite and cassiterite-wolframite concentrates amounted last year to 1,728 tonnes compared with 1,548 in 1950. Congo output was a little lower and that of Ruanda-Urundi improved.

The central hydro-electro power stations at Madingusha and Koni were in operation throughout the year and the copper mines experienced no shortage of electric power. With the copper market remaining favourable copper production in the current year is expected to exceed 200,000 tonnes compared with 191,959 in 1951.

The zinc content of the concentrates won last year was 88,705 tonnes. Most of the concentrates were shipped to the Belgian zinc works. An electrolytic plant—Metalkat—is under construction near Kolwezi in Katanga and will go into commission early next year.

Cadmium production last year at 24,316 kilos was 5,532 kilos below that of 1950. Most of the dust from which Cadmium is recovered is at present being stacked pending the erection of a plant to treat it. When this is put in commission, an increase in the Cadmium output is to be expected.

With the enlargement of existing plants and provision of new ones an increase in the cobalt production by the Union Minière is proceeding. The output in 1951 was 5,715 tonnes of cobalt metal—567 more than in the previous year.

ASPECTS OF PRECIOUS METAL OUTPUT

The gold output has been rising slightly since 1948. In 1950 it was 10,557 f. kilos against 10,958 kilos last year. During the war when gold was much needed for financing the output had risen to 19,591 kilos in 1941. The condition of gold producing companies continues to deteriorate; indeed, as compared with the legal price in 1939 the present price is only 1.69 per cent higher, while production costs which are continuously increasing are more than three times those of 1939. In 1950 the Government authorized producers to sell 60 per cent of the output above the legal price, and 60 per cent of the output was accordingly sold at Frs. B.65,250 per f. kilo but gold production cannot increase to any important extent while the selling price remains disadvantageous.

Silver production in 1951 was 118,046 kilos compared with 138,720 in the year previous. The bulk of it came from the Kipushi copper mine of the Union Minière. Some silver is also recovered in the treatment of gold ores.

As regards diamonds the output of industrial stones from the Lubilash River area was considerably expanded to 10,027,015 ct. compared with 9,604,124 ct. in 1950. With demand strong further increase may be expected. On the other hand, the production of gem stones mainly from the Kasai was a little down at 537,740 ct. but this was a big drop from the 1,804,005 ct. of 1938. In view of the known reserves a fairly steady output is expected in future.

There was a marked increase in the production of manganese ore in 1951 when Sudkat and Beçeka Manganese produced 70,945 tonnes compared with 16,990 in the previous year. Beçeka could have shipped much more but for difficulties on the Benguela Railway. However, these difficulties are now being overcome and a further increase should be effected this year. Production of Bastnäsite (a fluorocarbonate of cerium) in Urundi reached 154 tonnes in 1951 as compared with 54 in 1950. Given favourable conditions the production could be enlarged.

As usual there is no reference to radium and uranium ores in deference to American wishes.

THE PALEY REPORT—VI

Magnesium, Titanium and Zirconium

Following on our summary of the Paley Report's conclusions on aluminium, published in our issue of September 19, we summarize below the Report's conclusions on the important group of new light metals which have only begun to make an impact on industry in the past decade and the full potentialities of which can, as yet, scarcely be assessed.

MAGNESIUM

Of the three light metals still to make their main contribution towards the enrichment of world industrial supplies, magnesium promises far the largest quantitative contribution. The U.S. output in 1940 was 6,400 s.tons but three years later war exigencies had pushed output up to 170,300 s.tons; but this was produced irrespective of cost, and only the Freeport (Texas) electrolytic sea water plant was at work in 1951, with a capacity of some 30,000 s.tons. Six other Government owned plants are being put back into production to cope with the rearmament programme, of which the Dow operated sea-water plant at Velasco (Texas) is the only one judged to be economic. This, scheduled for restarting this year, has a rated capacity of 36,000 s.tons. Capacity of all seven U.S. plants is put at 130,000 s.tons of which 70,000 should be economic and 56,000 s.tons from Freeport and Velasco plants produced at less than the current price of 24½c. per lb. At the remaining plants costs may run between 28c. and 60c. per lb. and they depend on being subsidized.

Plants drawing their magnesia from sea-water naturally have to be sited near the sea where hydro-electric generating stations are not usually available and natural gas, lignite or coal must be employed to generate electricity to replace low cost hydro-electric power.

Magnesium has certain great possibilities of expansion in commercial demand. Weight for weight, it has a 50 per cent greater covering area as sheet than aluminium but against this must be set its low corrosion resistance especially in contact with iron, copper and aluminium, its inflammability in machining, the low tensile strength and inelasticity of its alloys, and the initially high price of the rolled and fabricated products which, however, should diminish as output is enlarged.

At present the largest use for magnesium is as an alloy for low stressed components in aircraft production, where its use is preferable to heavier aluminium alloys, and for the future its most promising structural uses are in fields where lightness and rigidity (but with limited strength) offer economies over heavier metals. Much research work still remains to be done on magnesium which would appear to be justified by the large potential sources of supply. The large scale use of magnesium would be expedited by the development of a magnesium alloy with better corrosion resistance or by finding a satisfactory coating for the metal. In view of this situation estimates of production twenty-five years hence must be largely conjectural.

Stockpile and military demands have raised production from 5,000 s.tons in 1946 to an estimated 100,000 s.tons next year; but once these needs are satisfied demand will presumably fall heavily. U.S. output in 1975 could, it is thought, reach 500,000 s.tons with a market volume of 100,000 to 1,000,000 s.tons depending on the technological progress made.

In 1950 the U.K. output was some 5,000 s.tons and that of Canada 1,700 tons. Germany originally the leading producer should again become important and other countries with low electric power costs should help.

By and large the price of primary metal should not rise appreciably, relatively to prices in general, in the next quarter of a century while that of fabricated products

should fall. A continuation of national stockpiling is advocated and there has been a natural disinclination to expand production facilities until research has superseded the present high cost methods.

TITANIUM

Titanium offers in prospect one of the most exciting additions to the group of commercial light metals. The modern history of the metal started in 1946. Prior to this date the applications of tataniferous material had been, and indeed at present still are, largely in the paint industry.

Titanium metal possesses an unusual combination of valuable characteristics. It is about 42 per cent lighter than stainless steel, and almost as strong, while it possesses practically equal corrosion resistance and actually better resistance in the case of marine corrosion. As compared with aluminium it is less corrodible, much harder and stronger weight for weight.

Hitherto the high cost of the small quantities of metal being produced has militated against its commercial use. Recent prices have been around \$6 for ingots and \$15 for sheets. However, at these prices military requirements are absorbing all the metal produced.

In 1946/47 U.S. production of titanium metal was only a few hundred pounds. Since then it has increased five-to-ten fold in each succeeding year till it reached a figure of 700 s.tons in 1951 while 5,000 s.tons is forecast for the current year. As long as technological developments remain so uncertain, demand by 1975 cannot be accurately projected. At or near present prices demand for military and special civilian uses might go to 50,000 tons in the next 25 years. On the other hand, if a continuous economic production process is discovered, which could bring the price of titanium down to a level competitive with steel, allowing for weight and performance adjustments, the demand for titanium might reach 500,000 to 2,000,000 tons annually.

The metal has hitherto been produced mainly by the Kroll process in which titanium tetrachloride is reduced with molten magnesium and also by the more expensive Iodide process. At present the metal can only be produced in small discontinuous batches and the most urgent research problem centres on the development of a low cost continuous production process. Other major research problems are the development of usable alloys and the improvement of methods for drawing, casting, machining and welding.

Such is the alluring picture presented for the application of capital and the best metallurgical brains. Success would possibly mean a cost reduction to the low figure of 75c. per lb. of metal as compared with 40c. in the case of stainless steel. Even if the price were reduced from \$6 to \$1 per lb. for ingots there are many uses which would present themselves, especially for the aircraft industry in structural parts and medium-temperature engines and surface applications; in ordnance equipment, the substitution of titanium for steel for airborne, man-handled and mobile combat types; while the unsurpassed resistance of the metal to corrosion would be of great value in pipes, tubing, condensers, plumbing fixtures, shafts, containers, laboratory equipment and working surfaces.

There is an abundance of ilmenite in the United States adequate to meet all demand for titaniferous ores over the next twenty-five years even should the metal production reach the dizzy height of 500,000 s.tons a year and still larger reserves in Canada. Here the work of the Quebec Iron and Titanium Corporation (Kennecott and New Jersey Zinc) is particularly outstanding. The Corporation's mines are in the neighbourhood of Allard Lake in Quebec where reserves of some 300,000,000 s.tons of massive titaniferous iron ores are believed to be available, the ores averaging about one third TiO_2 and a little over one-third Fe. At present the company is producing metallic iron and titanium slag at its Sorel works the slag being at present sold to the pigment industry and as a suitable method is worked out will be available for the production of metal. Thus, North America should become independent of supplies from India hitherto the main source of ilmenite supply.

ZIRCONIUM

Zirconium, like titanium, is a comparatively new metal, offering promise of greatly expanded usefulness in the future. The uses of zirconium compounds are well established, while commercial use of the metal is still in the embryonic, highly experimental, high cost stage. However, possessing such qualities as ease of formability, a high melting point ($1860^\circ C$), outstanding resistance to corrosion and low absorption of neutrons, zirconium metal has obvious possibilities, particularly in nuclear and high temperature applications. As an alloy constituent, zirconium imparts highly desirable properties to steel, magnesium and other metals, but the cost of producing it is still too high for widespread commercial acceptance.

The metallurgy of zirconium is generally similar to that of titanium so that reduction of costs should bring with it corresponding reduction in the cost of zirconium. But while zirconium promises expanded usefulness in future, this will only be for limited tonnages for highly specialized applications. The chief rôle for technology in the future of the zirconium metal industry is in finding ways to increase production and decrease the cost of the metal. Best chances for doing this appear to be with a continuous Kroll-type reduction process or a straight line iodide process.

Nuclear energy uses for zirconium are expected to remain firm, because zirconium combines excellent corrosion resistance with a low thermal neutron absorption cross-section.

The best chances for expanded non-nuclear utilization reside in zirconium's excellent corrosion resistance chiefly with respect to hydrochloric acid.

The zircon refractory industry is expected to continue its expansion into the special refractories field, but not to overtake the high tonnage lighter refractories. Before stabilized zirconia can attain its full stature as perhaps our most outstanding refractory, the cost of producing ZrO_2 from zircon will have to be reduced sharply by improved technology.

Outstanding promise as a heat resisting inter-metallic compound for extreme high temperature use (up to $6000^\circ F$) is being shown by zirconium boride. The next rôle for technology in this field is that of developing production methods and more effective metallurgical testing practices.

Raw material for zirconium production is abundant in relation to U.S. consumption. In 1950 some 25,000 s.tons of zircon were consumed and about 25 s.tons of pure zirconium metal.

U.S. reserves of zircon are considered ample for 25 years. Australia ships the highest grade material available to America; India, Africa and Brazil contain large deposits of zirconite and the latter country additionally, great

deposits of baddeleyite (ZrO_2), but a big reduction in treatment cost will be required to bring baddeleyite into the economic range. However, at present, more zircon is available from tailings from titanium plants than the market can absorb and this supply will increase as titanium production grows.

Price of course will exercise a big influence on expansion especially for ductile zirconium and price is a function of scale of output. A ten-fold increase in the use of metal might bring the price down from \$8 per lb. to around \$2.50 and increase the non-nuclear demand from 120 s.tons to 1,500 s.tons.

Mining Uranium at Wheal Edward, Cornwall

By PAUL STEIN, A.C.S.M.

Details of the work carried out at the Wheal Edward mine, in the St. Just area of Cornwall, with a view to testing its uranium potentialities was described by the author in an article which appeared in "The Mining Journal" on February 22 last, under the title "A survey of uraniferous deposits in Cornwall." At that time, only two levels underground had been explored, but enough encouraging information had been obtained to warrant further investigation.

From data obtained as a result of previous work it was decided to attempt further exploration and development at the mine, the primary objective being to reach the tin bearing portion of the lode without excessive expenditure. It was known that limited uraniferous mineralization existed in the upper levels and after arranging for disposal of any uraniferous ores produced with the Ministry of Supply—who gave their full co-operation—the work of investigating Wheal Edward was begun at the end of August.

This was effected by a group of students from Workstep College, who had requested facilities for the purpose of gaining experience in uranium geology. And after carrying out an extended geiger counter survey the students completed an underground survey which led to the discovery of extensions to the known uraniferous lode. Apart from the underground survey some significant surface occurrences were also mapped.

With the completion of the survey work small scale stoping has begun on the exposed lodes, and it is planned to preconcentrate the broken material by means of electronically aided hand-picking. Estimations as to the ore grade are made by comparing equal volumes, one of fresh ore against another containing a known uranium oxide content.

The main item of equipment in use is a Holman "Tractair," a tractor-compressor combination—and this machine was found to be ideal for this type of work since it solved the twin problems of ore transport and compressed air requirements at the same time. The students for their survey work were equipped with improved versions of Radiometrics' instruments, now manufactured by Messrs. Crossland & Nowell.

Lightweight aluminium ladders are in use underground and so far have proved to be highly successful; it remains to be seen, however, whether they will stand up to the rough usage associated with mining operations.

It is intended to attempt drilling by means of the hollow charge, using as a basis the procedure outlined in the I.M.M. paper presented by Mr. W. M. Evans on March 9, 1950.

Currently, all efforts are being directed towards producing sufficient ore to make the work self-supporting, but it is recognized that this may not be the best way to carry on preliminary explorations of this nature. The first shipment of ore was made on September 9.

Development of a Rotary Test Drill

By FRED D. WRIGHT and LEWIS H. BRAKEL

A drill unit designed by U.S. Bureau of Mines engineers for testing various types of rotary bits has been in use since April, 1950 at the experimental oil-shale mine, near Rifle, Colorado. The unit has a hydraulic drill and feed system, which provides the wide range of operating conditions necessary for adequate testing of drill bits and for obtaining the data needed for the design of production-scale equipment. Through the use of this unit, it has been proved that rotary drilling of vertical holes for mining the benches of the oil-shale mine is much cheaper than percussion drilling, and it is believed that in the near future the rotary drilling of horizontal blast holes in the top heading of the mine will prove equally economical. The following article presents a condensation of the Bureau of Mines Report of Investigations 4864, which gives details of all aspects of the system.

It has long been recognized that one of the most important phases of oil-shale mining is the drilling of blast holes. Most of the drilling research up to the present time has been on percussion drilling, and standard drilling at the mine is still done with percussion drills. However, because of certain inherent disadvantages of percussion drilling, experiments on rotary drilling were begun in 1948.

Throughout all these tests, the operating conditions were fixed by the drill unit and could not be varied appreciably. It was felt that several bits tested might have performed much more satisfactorily under other operating conditions, such as higher r.p.m., higher thrust, or both. It was obvious that, to give the bits a fair test and to determine the optimum drilling conditions, an adequate test drill would have to be obtained. With such a drill, it would be possible to vary and measure accurately the operating conditions independently of each other. No such drill was on the market. Before deciding that the Bureau should build such a machine, a careful analysis of the possible advantages of rotary drilling for oil-shale mining was made.

Some of these possible advantages were first, that because of a drilling rate of 60 or more inches per minute, compared to 20 inches per minute with percussion drills, the cost of drilling labour per ft. of hole could be reduced at least 50 per cent.

Second, because the drilling efficiency and rate of rotary drills do not decrease as rapidly in long holes as they do with percussion drills, rounds of over double the present depth could be drilled on the top heading of the mine. This would increase shovel efficiency and reduce the cost per ton of scaling loose rock from working faces preparatory to drilling.

Other considerations were that power consumption would be reduced because electric power could be used directly or through a more efficient hydraulic system rather than through an inefficient compressed-air system, and that cost per ft. of hole for drill-rod replacement would be negligible. Present cost of drill rods for percussion drilling is 2c. per ft. of hole drilled. The greater part of the noise from drilling would be eliminated, thereby improving working conditions and morale.

CONSTRUCTION OF THE ROTARY TEST DRILL

In summary, it was considered that capital costs for drilling equipment and initial mine development requirements also would be reduced. Less than half as many rotary-drill jumbos as percussion-drill jumbos would be required to produce a given tonnage, and in addition, initial development of only about half as many headings on the top level would be required for full production. Because of these and other possible advantages of rotary drilling, it was decided that the Bureau should build its own rotary test drill.

To have a test drill that could operate under wide limits of thrust, r.p.m., and torque, a completely hydraulic drill was required. The contract for this equipment was awarded to T.E.C. Engineering Corp., which made the lowest bid on satisfactory equipment, and construction of

the drill unit was done by the Winter-Weiss Co. from the Bureau's design.

The completed test drill consists of a hydraulic drill motor mounted on a 15-ft. feed carriage. The drill motor can develop a maximum torque of 2,100 in.-lb. and can be controlled between 0 and 1,050 r.p.m., it has a hollow drive shaft and water swivel for wet drilling. The drill motor is mounted on a slide or carriage, which is attached to an endless chain, driven by a hydraulic feed motor and can deliver a maximum thrust of 4,000 lb. to the drill motor. Both thrust and torque can be pre-set to any desired value below their maximum limits. A 50 h.p., 440 v. electric motor operates the hydraulic pumps that drive the motors. The complete assembly is mounted on a model HD-10 tractor.

There are actually two separate hydraulic systems, one for the drill motor and one for the feed motor and jacks. This facilitates cutting out the hydraulic drill-motor circuit if an electric motor is tested for a drill motor. The pumps for both systems are driven by a single 50 h.p., 1,200 r.p.m. electric motor (2). The drill motor pump (1) supplies approximately 46 g.p.m. of hydraulic fluid at a maximum pressure of 1,600 p.s.i. The oil flows from the pump directly to a lever-operated, 1½ in.-size, 4 way valve (3), which has three position detents with all ports open in neutral. Therefore, oil will flow freely back to the tank (4) through this valve when the handle is in the neutral position. The outlet ports of the valve are connected with the drill motor (5), permitting the motor to be run in either direction. A pilot-operated, 1½ in. pressure-relief valve (6) is connected through a tee with the line from the pump to the four-way valve to limit the maximum pressure in the circuit. A pressure gauge (7), calibrated in in.-lb. of torque, is attached to the valve to show the pressure in the circuit and the resulting drill-motor torque. If a maximum torque of less than 2,100 in.-lb. is desired, the pressure-relief valve (6) can be easily adjusted to the value desired. A 1½ in. dial-type flow-control valve (8) also is connected through a tee with the supply line. This valve can be adjusted for bypassing back to the tank any flow varying from 0 to 50 gallons per minute, thereby controlling the speed of the drill motor. The valve passes a uniform flow for any particular setting, unaffected by the pressure in the system. Any surplus oil not required, owing to reduced speed, is bypassed back to the tank.

There are two other hydraulic pumps in the circuit, which serve the feed motor and the two jacks. Two pumps were used to eliminate the need for expensive and complicated variable-delivery pumps. These pumps, a 24-g.p.m. low-pressure pump (9) and a 5-g.p.m. high-pressure pump (10), furnish power to the feed motor (11), which, through a gear reducer and an endless chain, can exert a thrust up to 4,000 lb. on the drill motor when it is being advanced and a thrust of 1,000 lb. when it is being retracted. Maximum linear speed of the drill motor along the slide is 18 ft. per min. when advancing and 100 ft. per min. when retracting.

The 5 g.p.m. pump (10) provides pressure up to 950 p.s.i. to the feed motor, when feeding forward. Both pumps

running together provide approximately 28 g.p.m. at 350 p.s.i. for the feed motor during retraction of the drill. The 5 g.p.m. pump is protected by a pressure relief valve (14) set for a maximum pressure of 1,000 p.s.i. Oil from this pump also is available for the hydraulic jacks when the four-way valve (15) is in the neutral position, blocking the supply to the feed motor.

The 24 g.p.m. pump (9) also can feed the four-way valve (15) through a check valve (16). This valve prevents oil from the high-pressure pump (10) from backing into the low-pressure pump (9) when the smaller pump is operating at pressures above 350 p.s.i. The low-pressure pump (9) is protected by a pressure relief valve (17) set at 350 p.s.i. This relief valve has a remote control or vent connection, which is connected through a $\frac{1}{4}$ in. check valve (18) with the line from the four-way valve (15) to the feed motor (11), which is under pressure during retraction of the drill. The needle valve in this same line permits adjustment of the return speed.

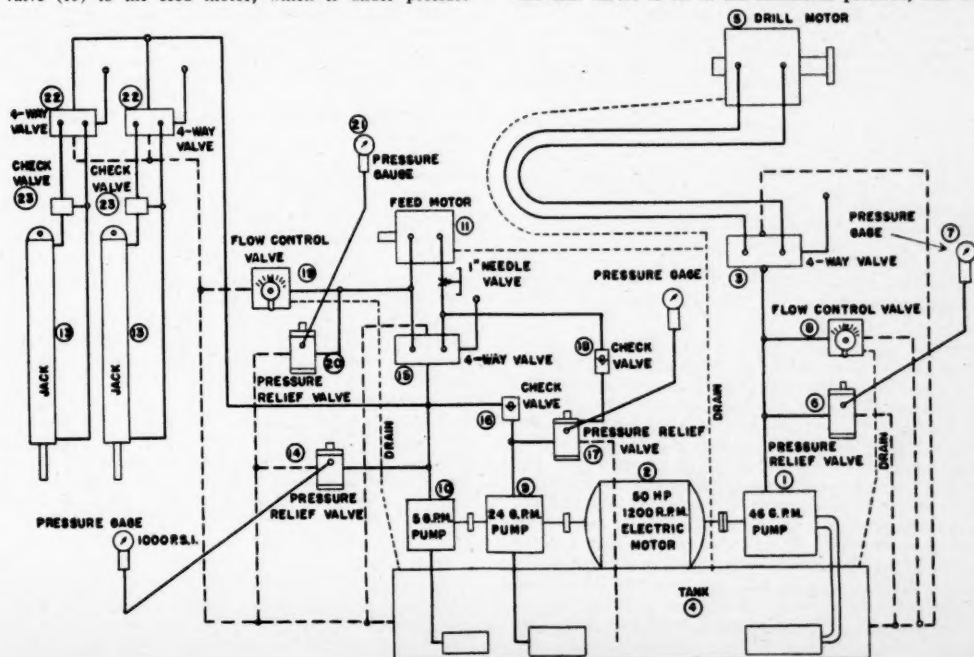
OTHER FACTORS OF CONSTRUCTION

The four-way valve (15) for the feed motor is equipped with three position detents. When the valve is in neutral position, the oil inlet port is blocked while the right outlet port is connected with the exhaust. This is done to permit the remote controlled pressure-relief valve (17) for the 24 g.p.m. low-pressure pump (9) to be unloaded to approximately 150 p.s.i. by means of the control vent line with $\frac{1}{4}$ in. check valve (18), whenever the four-way valve is in neutral and the feed motor is not running. When the drill is being fed forward, the right outlet port is connected to the exhaust. Thus, when the drill is being fed forward, the low-pressure pump (9) is being unloaded through pressure-relief valve (17), and high-pressure pump (10) is delivering the required oil to the feed motor (11) for forward motion of the drill. Connected with the left line from the four-way valve (15) to the feed motor, which is under pressure

during the forward or feed rotation of the motor, is a flow-control valve (19) for controlling the speed during the feed cycle by bypassing excess oil. This valve gives a uniform bypass flow for any particular setting unaffected by the pressure in the circuit. Connected with the same line is a pressure-relief valve (20) which can be set for various pressures so that a maximum pressure for the feed motor can be selected independently of the setting of other relief valves. This permits any desired feed motor torque and consequent thrust on the drill to be selected within design limits. A pressure gauge (21) connected to the relief valve (20) is calibrated in p.s.i. and in pounds of thrust on the drill motor.

When the four-way valve (15) is in neutral, approximately 5 g.p.m. of oil up to 1,000 p.s.i. are available for operating the two hydraulic jacks through their respective lever-operated four-way valves (22). There are two pilot-operated check valves (23) in the jack thrust lines, which definitely block the oil in the rear end of the cylinders until pressure is applied through the four-way valves to the front ends of the cylinders.

The four principal operating factors in rotary drilling are the feed rate and thrust of the feed motor and the r.p.m. and torque of the drill motor. Feed rate and thrust are dependent on each other. Torque and r.p.m. also are interdependent. For test purposes there are four possible combinations of factors that can be fixed for the test. These combinations are feed rate and r.p.m., feed rate and torque, thrust and r.p.m. and thrust and torque. The factors not fixed are then dependent on the type of rock being drilled and the drill bit. The experimental drill allows use of any of these combinations. For example, if a bit is to be tested at a given thrust and r.p.m., the pressure relief valve on the feed motor is set for the given thrust and the flow-control valve of the feed motor is closed so that all the oil is flowing through the motor. The pressure-relief valve on the drill motor is set at the maximum pressure, and the



The Hydraulic System of the Rotary Drill

flow-control valve is set for operation at the given r.p.m. If the bit encounters rock that is hard to drill, or if the bit dulls, the feed rate may decrease and the torque increase, but the thrust and r.p.m. will remain constant as long as the feed rate or required torque do not exceed their maximum limits. In a similar manner, any of the other possible combinations of operating factors may be fixed.

DISCLOSURES OF OPERATION

In the operation of the drill, performance of those bits previously treated was materially improved. Those with the harder grades of tungsten carbide, which chipped and cracked when tested with the air drill, would not fail when tested with the new hydraulic drill, this apparently was due to the fact that the hydraulic drill operates very smoothly and eliminates most of the shock and impact stresses induced when drilling with an air drill. Recent experimentation has, therefore, been concentrated on bits having harder and more wear-resistant grades of tungsten carbide.

In general, it has been found that, for best drilling life, low r.p.m. at high thrust is most effective. For highest drilling rates, high r.p.m. and high thrust are necessary. The performance of a 2 in. diameter bit tested at 400 r.p.m. and at different thrusts is shown in the following table:

| R.p.m. | Thrust lb. | Ft. drilled between sharpenings | Avg. penetration rate, in./min. |
|--------|---------------|------------------------------------|------------------------------------|
| 400 | 2,500 | 112 | 53 |
| 400 | 3,200 | 141 | 60 |
| 400 | 3,700 | 184 | 69 |

Before being discarded, one bit drilled 1,123 ft. through the bottom 23 ft. of the Mahogany ledge. This section averages 9 ft. of lean shale (17 gall. per ton) and 14 ft. of medium-grade shale (37 gall. per ton). In a commercial mine, the bottom 34 ft. of the Mahogany ledge would be taken as one bench. This would add 11 ft. of rich shale, which would have to be drilled. Inasmuch as rich shale is very easy to drill and causes little bit wear, this bit should drill well over 1,200 ft. on the benches. Several other types of 2 in. diameter bits have given equally good performance. The cost of drill bits and drill steel for percussion drilling is about 2.8c. per ft. of 2 in. diameter hole.

Blasting experiments have indicated that 1½ in. diameter blast holes are preferable to 2 in. holes for breaking bench rounds. It is, therefore, probable that the smaller-diameter holes would be used in a commercial operation. In a recent experiment a 1½ in. rotary bit was tested by drilling vertical holes through the bench of the underground quarry. The bit drilled 766 ft. under constant test conditions of 400 r.p.m. and 3,000 lb. thrust before it required sharpening. The penetration rate was 83.7 in. a minute at the start of the test and 67.7 in. a minute at the end. The average penetration rate over the 766 ft. drilled was 75.1 in. a minute. It is estimated that bits of this type would average five sharpenings apiece and that the total footage drilled per bit would be 4,000 ft. or more.

Thus, rotary drilling for the benches is definitely cheaper than percussion drilling on the basis of drill steel and bits alone, not including other factors, such as reduction in cost of drilling labour by one-half to two-thirds and power consumption.

Protective Footwear in British Mines

By A. G. THOMSON

No regulations exist to compel workers in Britain's mines and quarries to wear protective footwear, because it is considered that any measures of this nature would be difficult to enforce. The policy of the Ministry of Fuel and Power, therefore, is to rely on persuasion rather than on legislation, and advantage is taken of every opportunity to encourage the use of safety boots. This policy is being carried out with the full co-operation of the National Coal Board and the National Union of Mineworkers. In the following article the author details the protective standards already set in British safety footwear manufacture, and points out that sales of safety boots among mine and quarry workers have enjoyed a steady increase for more than a decade.

During the years when footwear could only be purchased on a coupon scheme the Ministry was able to turn this restriction to good account by persuading the Board of Trade to let miners buy safety boots coupon-free. Underground workers in coal mines were able to obtain, duty free, two pairs of safety boots each year and colliery surface workers and workers at other mines and quarries one pair each year. The inducement proved very helpful in stimulating the purchase of safety boots, but when the coupon scheme was terminated, this particular form of persuasion also came to an end.

Utility specifications for protective and safety footwear were laid down during the war, when utility schemes were introduced for various articles, including boots and shoes. The Board of Trade was able to announce that safety and protective boots manufactured in accordance with the utility specification would be tax-free, provided that two requirements were satisfied. In the first place they had to conform with the utility specification, and secondly they had to carry the stamp of the British Standards Institution, which had prepared a specification for safety and protective boots in respect of the toe-caps only. Thus a miner purchasing tax-free safety boots could be certain that the quality was good and that B.S.I. toe-caps were incorporated in the boots.

There was a period during the war when steel toe-caps became extremely scarce. This shortage arose because the importation of steel toe-caps from the United States had been suspended and at that time no caps of a similar type

were produced in Britain. In 1944, however, a leading boot manufacturer was allowed to visit the United States with authority to arrange for the resumption of imports and about the same time some British firms went into the question of manufacturing safety boots with hard steel caps in this country. These caps are not easy to make because the shape is difficult and the material tough, but protective footwear of satisfactory quality and price is now produced by a number of manufacturers in Britain and a considerable variety of types and styles can be obtained.

Two types of safety boots have been purchased by miners in recent years. The best and strongest are those which conform to the B.S.I. specification and boots of this type are capable of resisting an object weighing 60 or 70 lb. dropped from a given height. To be capable of giving this very high degree of protection the toe-cap had to be made of a special carbon steel which could not always be obtained. In order to avoid limiting the production of protective footwear a second type known as a protective boot, was introduced. It conformed with the Board of Trade utility specification and with the B.S.I. specification for safety boots, but the toe-cap was made of different material.

On March 17 this year the utility footwear scheme came to an end and the Board of Trade ceased to exercise control over the quality of footwear. The British Standards Institution cannot force manufacturers to apply for a licence and use its mark because it is entirely a voluntary organization. However, the President of the Board of Trade expressed the hope that the British Standards Institution and other in-

interested parties would get together with the object of maintaining quality standards. Since that date the interested parties have considered the matter and it is understood that the Boot and Shoe Manufacturers' Association are considering the possibilities of a voluntary scheme.

A LACK OF RELIABLE STATISTICS

No reliable statistics are available in regard to the numbers of pairs of protective footwear distributed annually to miners. All new recruits to the industry are supplied by the National Coal Board with a pair of safety boots and safety helmet, free of charge, but there is no means of keeping track of the number of pairs of boots which are purchased every year by the miners themselves. A miner in need of replacements can obtain them from the pithead baths canteen, from a co-operative society, or from any retailer who supplies these articles. Some pithead baths and canteens which handle safety boots also sell other types of footwear. A miner, like any other member of the community, might be "price conscious" and if he had to pay a few shillings more for safety boots, it is possible that he might decide not to buy them. Since July 1, 1952, when the Miners' Welfare Act of 1952 came into force, the National Coal Board have taken over the responsibility for "colliery welfare," which includes the maintenance and provision of pithead baths. This should give the Board rather more influence over the purchasing policy of pithead baths, thus placing it in a more favourable position to push sales of safety boots. So far as co-operative stores and retail stores are concerned, the miner's transactions are entirely his own affair and there is, of course, no means of finding out how many pairs of safety boots are purchased there.

Although no comparative figures can be given, sales of safety boots have unquestionably increased during the past twelve years, one of the reasons for this improvement being the special incentives which could be provided during the days of coupons and utility schemes. The problem now is to find other inducements which might prove equally effective in stimulating the purchase of safety boots.

While mining and quarrying operations come under the Ministry of Fuel and Power, factories, foundries, workshops, etc. are the responsibility of the Factories Department of the Ministry of Labour and National Service. The risk of injuries to feet is always present in workshops where heavy objects are handled, particularly if the surface is highly polished and slippery or the hands of the labourers are greasy. Moreover, an object weighing only two or three pounds gives a blow equivalent to several hundred pounds when dropped from a height of three feet. Injuries may also result from wearing thin or worn soles which can be pierced by swarf or nails. Many serious accidents in industrial workshops have been averted by steel toe-caps, which have withstood weights equivalent to a ton or more, leaving the wearer uninjured or with minor bruises.

The results of an enquiry into accidents due to the handling of goods or to persons falling were given by the Chief Inspector of Factories in his Annual Report for 1946. The investigation lasted for a fortnight, during which period a total of 2,000 accidents were investigated. These were analysed by various causes such as objects dropped, and also by what might be termed secondary causations. Out of the 2,000 accidents no fewer than 360 were accidents to feet, and in 247 cases the evidence indicated lack of foot protection. The implication is that in these 247 cases the accident itself might not have been avoided had the victim worn protective footwear, but the injuries would have been prevented or minimized, rendering many of these accidents non-reportable.

At the Safety, Health and Welfare Museum in Horseferry Road, Westminster, the Department of Labour have a display of protective footwear, which is an impressive indication of the progress which has been achieved by

British manufacturers in this highly specialized field. In a safety boot described as suitable for mining the toe-cap is heavily reinforced for protection against falling articles. A narrow steel band at the front of the toe increases the durability of the boot. Another type of safety boot is shown after use. It is equipped with the usual type of internal steel toe-guard and has an external plastic cover on the toe-cap and heel to protect the leather against sharp material. Although the boot has been subjected to very heavy wear by a worker feeding a quartz crushing plant, the plastic is relatively undamaged. An industrial type shoe is provided internally with a steel guard while externally the toe-cap is covered with a plastic material, the latter being designed to afford protection against the cutting effect of sharp or abrasive materials such as swarf, coal or limestone chippings. Various spats and leggings are available for workers whose legs are exposed to possible splashes of hot metal.

For workshop use there is a large demand for safety boots and shoes of a medium weight. There is also a shoe, known as an "executive type," which is of still lighter construction and is intended for people who spend a lot of their time walking round machine shops and other departments where hazards to feet exist. Nowadays, protective footwear is obtainable which is not only comfortable to wear but is indistinguishable from ordinary footwear. Some industrialists maintain that if a worker has to change his footwear on entering and leaving a factory, there is a much greater risk that he might not be wearing safety boots when an accident occurs. For the same reason workers in some factories are encouraged to buy two pairs. These considerations would appear to be equally applicable to mine workshops.

PERSUASION RATHER THAN LEGISLATION

Persuasion rather than legislation is also relied on to encourage miners to use other items of safety clothing. For many years the Ministry of Fuel and Power has endeavoured to encourage the use of safety helmets. In some mines helmets are provided free of charge, in others the employee pays a portion of the cost, and in others he is given no assistance whatever. It is very difficult to judge the number of helmets which are worn in any one year. Manufacturers' figures show that sales are increasing, but the average life of a safety helmet is not known. There is no doubt that safety helmets are more widely used than they have ever been. Various types are available and the quality has gradually been improved. The British Standards Institution have taken over the responsibility for testing, which formerly was done by the Ministry's Safety in Mines Research Establishment.

Similarly the use of safety gloves underground particularly in the hand loading of larger fragments into tubs, chutes or conveyor lines for transportation, play an important part in preventing the smaller type of accident which takes a toll in crushed hands and lost man hours.

For more than ten years the Ministry's efforts to promote the use of safety gloves have been hampered by the purchase tax on industrial gloves. The authorities concerned are unwilling to relieve miners of the tax on safety gloves, holding that the term "safety glove" is ambiguous and that it would be impossible to draw up a specification for a glove for use in coal mines only. It is contended that as soon as tax-free gloves became available they would be used for gardening, motoring and other purposes not associated with mining.

In co-operation with the National Coal Board the Disabled Persons' Employment Corporation has tried to produce safety gloves suitable for miners. A number of mines have been experimenting with these special gloves, particularly in South Wales. Here again, the extent of the industry's contribution towards the cost varies in different pits and areas, an anomaly which doubtless will eventually be removed.

MACHINERY AND EQUIPMENT

A Direct Hammering Concrete Compactor

A new tool to provide a more positive method of applying work to the loose concrete of road surfaces so that a more definite compaction is obtained has been developed by Messrs. Holman Bros. Ltd. The Holman Pneumatic Concrete Compactor employs a new principle of direct hammering of the top surface concrete with pneumatic hammers. It has obvious applications within the mining industry for the laying of surface roadways and for the concrete track installations at underground shaft stations.

The manufacturers state that by the employment of the direct hammering principle a thorough compaction is ensured, as each 4 in. width of bay is subjected to over 1,000 blows per minute. Latence is thus forced out to provide a good closure at the top surface, and so far as surface road work is concerned, by use of 6:1 mixes and 0.5 water/cement ratio and with two layers of reinforcement in a depth of 8 in. of concrete, compaction of the whole mass is successfully accomplished in one operation.

The CC1, CC2 and CC3 compactors consist essentially of one, two or three pneumatic hammers mounted on a wooden batten, which transmit their blows direct to a steel channel flexibly secured to the batten. Holman Sub Grade Compactors are similar in principle, and are available for the compacting of the lower layers of two layer roadways.

Representative specifications of the compactors show that the CC1 has a 5 ft. compactor channel, while the lengths of the two compactor channels in the CC2 models are 9 ft. and 12 ft. respectively. The channels are 4 ft. in width on all models, and in length the channel on the CC3 model is 15 ft. 6 in. Overall length varies from 9 ft. 4 in. in the CC1 to 19 ft. 10 in. in the CC3, the dimensions including measurement of the handles. All models have an overall width of 1 ft. 8 in. and air inlets of $\frac{1}{2}$ in. BSP. Their weights range from 190 lb. to 380 lb., while free air consumption at 80 lb. sq. in. is 20 cu. ft. per min. in the CC1, 40 cu. ft. per min. for both CC2 models, and 60 cu. ft. per min. for the CC3. The compactors will accommodate bays of maximum widths ranging from 4 ft. 6 in. to 15 ft.

A Range of Lightweight Accumulators

Stated by the manufacturers, Venner Accumulators Ltd., to be primarily intended for use where limited space, lightness and a high rate of discharge are specific requirements, their Silver-Zinc Accumulator is thus worthy of consideration for portable lighting equipment in the mining industry and is particularly applicable for use in miners' cap lamps. The accumulator is presented as the outcome of nineteen years of experiment and research.

In size and weight the accumulator is stated to average one-fifth the size and one-sixth the weight of other corresponding units, and the whole of the positive and negative assemblies consists of active materials which are utilized during the operation of the cell, a method of construction which avoids the use of pasted grids with consequent reductions in size and weight. The cells are presented as being virtually unspillable.

The accumulators give useful output to -30°C . and no damage occurs if complete freezing at -59°C . takes place. So far as the opposite extreme of temperatures is concerned, limitation is imposed by the case material, which in standard types has a softening point of approximately 85°C . A/H efficiency of 90 to 95 per cent and a watt/hour efficiency of 80 to 85 per cent are obtained in normal service. It is interesting to note that the smallest accumulator designed for such duties as attachment to miners' cap lamps weighs $\frac{1}{2}$ oz. and measures $\frac{3}{8}$ in. in length, $1\frac{1}{2}$ in. in height, and is $1\frac{1}{2}$ in. in breadth. It has an A/H capacity of 0.5 and a voltage of 1.5.

Single Roll Breakers

Single roll breakers by British Jeffrey-Diamond Ltd. have been evolved as the result of long experience in the design and manufacture of this type of equipment. The breakers accurately size such materials as coal, coke and various ashes, to produce in one operation a good cubical product of between 8 in. and $1\frac{1}{2}$ in. with a minimum of oversize and fines. The machines are produced in two types and seven sizes, ranging from the 15 in. unit for small capacities and a maximum feed size of 6 in. cubes, to the 36 in. machine for large capacities and a maximum feed size of 24 in. cubes. These breakers have a definite application within the

mining industry, and are described in a comprehensive and interesting pamphlet.

The Mark 1 models range from the 15 in. unit which has a motor of approximately 8 h.p. maximum and will reduce 6 in. cubes at a rate of 25 tons per hour through a 3 in. square mesh screen, and 10 tons per hour through a $1\frac{1}{2}$ in. square mesh screen. The largest model of the Mark 1 range, the 36 in. unit, has a motor of approximately 90 h.p. maximum and will reduce 500 tons per hour through an 8 in. square mesh screen, this output grading down to 155 tons per hour through a $1\frac{1}{2}$ in. square mesh screen.

The Mark 2 unit is a development of the Mark 1, but has the breaker plate mounted on an eccentric shaft driven by a spur gear from the breaking roll shaft. This causes the breaker plate to oscillate in relation to the breaking roll, thus improving efficiency. It is claimed by the manufacturers that the throughput obtainable is increased by up to 20 per cent according to the type of material and the product required. The 18 in. unit of this type reduces 20 tons per hour through a $1\frac{1}{2}$ in. square mesh screen, and the largest size, the 36 in. breaker, reduces at 550 tons per hour through an 8 in. square mesh screen. This output grades down to 170 tons per hour through a $1\frac{1}{2}$ in. square mesh screen. In all models of the breakers these tonnages comprise an 80-90 per cent reduction of total input, and the capacities are the averages which may be expected when reducing medium-hard bituminous coal.

Over Two-Mile Power Line Span Links Cominco's Hydro Plants

A 170,000 volt 72,000 kva. power line span has recently been completed at Kootenay Lake, B.C., which is reported to be the longest of its type in the world. The distance between towers is 10,556 ft., and as far as can be determined, the line is about 3,000 ft. longer than the longest known span, located in Switzerland.

Fabricated and erected by Dominion Bridge Co. Ltd., Vancouver, for The Consolidated Mining and Smelting Co., of Canada Ltd., the span is a link in Cominco's 87-mile power line between its hydro plants on the Kootenay River near Nelson, and mining, concentration and future chemical fertilizer operations at Kimberley, B.C. The lake span is currently supplying power to the company's Bluebell Mine at Riondel. The last leg of the line to Kimberley is still under construction.

Using a route around Kootenay Lake for the project was out of the question because it would have required an extra 80 miles of power line and the laying of a cable under the lake was far too costly; consequently it was decided to span the lake by overhead cables. Installed at the west side of the lake on a hill more than 1,200 ft. above the water, are three towers 50 ft. high which carry the cables to a single tower 366 ft. high located on the eastern shore.

Some idea of the problem of stringing the cables may be obtained from the fact that each $1\frac{1}{2}$ in. diameter galvanized steel strand is 10,733 ft. long and weighs approximately 18 tons. Each strand was prestressed and is designed for 55 tons maximum tension.

Underground Transportation Equipment

Information of underground rolling stock units manufactured by John Ingham & Sons Ltd. has recently been presented in an informative brochure. Specific information is given of buffers, couplers, pedestals, wheels and axles produced by the firm, and prominent place is given to the various tubs used for spoil transportation. In a note on these tubs which appeared in our September 19 issue, the word "tub" was inadvertently printed as "tube" throughout. The brochure also contains interesting details of Ingham man-riding equipment.

Man-riding cars made by the firm have an overall height of 3 ft. and can carry up a gradient of 1-5. These units are presented as unusual cars designed for unusual conditions, and are equipped with leaf spring suspension, silent running resilient rubber insert wheels, Sorbo rubber lined seats, and a luggage compartment. Other features include perspex windscreens, safety brakes, retractable safety riding bars, saloon roofing and a powerful battery headlamp which may be removed for charging. The units are one more factor in the modern trend which regards the speedy and comfortable transportation of miners from face to shaft station as a vital facet of modern mining.

METALS, MINERALS AND ALLOYS

With the U.S. steel industry now working at 104 per cent of rated capacity, American observers consider that steel users may expect to see their requirements met practically in full in 1953, although demand for the moment continues to exceed supply due to delivery losses during the strike. This picture ties in with the forecast of an easing steel position in this country, given elsewhere in this issue by our Iron and Steel Correspondent.

The re-opening of lead dealings on the London Metal Exchange this week, to which we refer under "Notes and Comments," has been accompanied by other relaxations. From October 1, licences will not be required for the acquisition and use of lead, lead alloys, lead scrap and residues, re-melted zinc, zinc alloys, zinc scrap and residues, copper scrap and residues and copper alloy scrap and residues. But licences will still be needed for the purchase of unwrought copper and copper ore and concentrates; they are also necessary for acquiring virgin zinc and zinc ores and concentrates. The new Order does not affect the restrictions on the use of copper and copper alloys in making certain articles.

COPPER.—U.S. demand for domestic copper continues very heavy and it has been rumoured that the O.P.S. may review domestic price ceilings during this month. Imported copper remains very firm at 36 to 36½c. Wire mill operators in particular have been stressing the copper shortage and have asked the Administration to defer stockpile purchases.

For the next few days, the American Smelting Co.'s copper mines in the province of Coroico in Bolivia will be closed and only a maintenance staff will be kept on. The Bolivian Government is due to take over the mine on October 7. The authorities have expressed their determination to work the mine and their hopes to repeat the experience of the San Jose mine in the district of Oruro, where, so it is claimed, the adoption of the collective labour system is giving satisfaction.

The European workers in the Northern Rhodesia copper belt have decided not to work overtime except to maintain essential services. This action follows the collapse of conciliation talks between the miners and the companies on the question of increases in the basic pay of daily paid men and the consolidation of a cost of living allowance into basic pay.

LEAD.—With the resumption last Wednesday of lead dealings on the London Metal Exchange (to which we refer this week under Notes and Comments), the Ministry of Materials has ceased to be a supplier of the metal. On the next page we give some notes relating to the provisions of the lead contract which will form the basis for dealings on the Metal Exchange.

The U.S. lead price looks like staying firm at 16c. following the G.S.A.'s request last week for offerings for the permanent stockpile at this price. Custom smelters are reported to have responded with offers of some 30,000 tons for delivery by March 31 next. Acceptance of these offers has still to be confirmed. Meanwhile, producers report October deliveries to be already about 80 per cent booked.

Zinc Corporation has taken a three-year option over a "tremendous lead-silver deposit" on the Wilton River in Arnhem Land, Australia. A report from Darwin suggests that the deposit might be worked by bulldozer.

For this reason the opening of dealings on the London Metal Exchange at some £20 per ton below the 16c. level is not thought likely to have any immediate effect on the American price, although the New York market had not apparently expected dealings to commence at so low a figure. Lead at £107 per ton is equivalent to 13½c. per lb. or about 15½c. allowing for the import duty, and shipping and other costs.

TIN.—Although the Reconstruction Finance Corporation, acting through the agency of Mercantile Metal and Ore Corporation, has agreed to buy 6,000-7,000 tons of tin concentrates from Bolivia, no long-term contract has yet been agreed and the R.F.C. is believed to be opposed to any such commitment until the legal implications of the impending nationalization measures have been clarified. The ore which forms the subject of the present deal now announced is lying at the Pacific Coast ports and is consequently available immediately. The base price is 117½c. per lb. f.o.b. South American ports.

The rumour that a tin-smelter is to be constructed in Bolivia still persists and further reports have filled in some of the details.

The initiative is, according to these reports, being taken by an Argentine financial group headed by Senor Salim Chacur and the scheme covers a much more ambitious programme than the erection of a tin-smelter. The construction of a match and an explosives factory is also suggested. The President of Bolivia is stated to have signed an agreement with the group and work is to commence, under penalties for delay, within 180 days. The Bolivian Government is to have a 33 per cent interest in the tin-smelter project and 40 per cent in the explosives factory. The reasons for treating this story with reserve were suggested in *The Mining Journal* of August 29 last (page 230).

There may be serious unrest among the Bolivian tin miners as a result of the decision announced by Compania Minera Unificada Cerro Potosi to close down in three months' time. The reason given by the company, which is a subsidiary of the Hochschild group, is the impossibility of carrying on "in the present conditions of foreign exchange and in view of the company's numerous obligations." No reports are to hand regarding the reaction of the Bolivian Government to this decision.

In the first eight months of the year Indonesia has exported 21,796 tons of tin in concentrates, or over 1,700 tons more than in the corresponding period of 1951. As the total Indonesian exports for 1951 amounted to 30,750 tons, the total for 1952 would seem to be near the 32,500 tons mark. The official Indonesian export figures indicate that there has been a big switch in the destinations to which the tin in concentrate are sent. Whereas in the first eight months of 1951, exports to the U.S. were 6,418 tons, in the similar period of the current year they only reached 4,642 tons. Holland has taken up that difference and the increase in the totals already mentioned; the Dutch share was 17,117 tons in January-August, 1952, as compared with 13,528 tons in the first eight months of last year.

Malayan production in August amounted to 4,755 tons, making a total for the first 8 months of this year of 37,802 tons compared with 37,845 for the corresponding period a year ago.

ZINC.—Although the U.S. General Services Administration has been buying an unspecified quantity of zinc at 13.50c. per lb., the American market is still divided into those selling at 13.50c. and those who are demanding—and receiving—14c. Meanwhile, the Canadian market has moved to a lower level by Consolidated Mining and Smelting, reducing the wholesale price of prime western zinc to 13c. per lb.

ALUMINIUM.—For some time there has been a discussion concerning the need for further extensions to the aluminium producing capacity of the U.S. Reports from New York suggest that the supporters of the extension have won the day and that plans will soon be announced concerning the output of another 180,000 tons per year. Since the present programme of mobilization was started 670,000 tons of additional capacity have been authorized.

Canadian exports of virgin aluminium during August amounted to 42,825 s.tons as compared with 23,564 s.tons in July. The shipment to the U.K. of 32,414 s.tons accounted for the bulk of the August total. The U.S. took 7,623 tons and Switzerland 595 tons.

KYANITE.—Searches for kyanite, which is becoming increasingly important for the manufacture of jet engines and for other high temperature insulation duties, have brought to light large deposits near Sudbury, Ontario. No details of the discovery are given, nor is there any indication whether Canada will be able to become independent of her supplies at present coming from Africa and India.

NICKEL.—Two contracts have been made by the U.S. Defence Materials Procurement Agency with two Canadian firms for the production of nickel. East Rim Nickel will mine and crush at least 3,500 s.tons of ore in the Sudbury district each month and Falconbridge Nickel Mines will process the ore for the U.S. Government. In this way, the nickel will become more quickly available than if a processing plant were to be erected on the East Rim property. I.M.P.A. has agreed to take a total of 65,000 s.tons of ore.

URANIUM.—The recent list of South African gold mines which are to produce uranium will be soon extended by the addition of another nine mines, bringing the total up to twenty-two.

It would appear that the terms of the contract with these extra companies will be much the same as the earlier companies.

GOLD.—The output of gold in Western Australia during August was at the high level of 60,112 f.oz. This is lower than the 64,854 f.oz. of the previous month, but it is much higher than many of the earlier months this year.

I.M.C. Fourth Quarter Allocations

Copper.—Total allocations to thirty-four countries amounted to 747,655 tonnes, an increase of some 3,500 tonnes over the third quarter allocation. Of this total the U.S. is to receive 362,000 tonnes (—6,100) together with an authorization to purchase up to a further 16,000 tonnes specifically for the stockpile. Britain's allocation is 101,800 tonnes (+1,500). The I.M.C. note a steady improvement in the supply position during the year together with indications that the market was easing. Chile still reserves the right to sell 20 per cent of her output outside the allocation plan.

Nickel.—Thirty-six countries will receive 37,050 tons. Of this amount the U.S. receives 24,931 tons (+304) and the U.K. receives 5,473 tons (+45). The I.M.C. states that although nickel supplies increased in the third quarter as anticipated, essential defence needs are increasing at the same time so that allocations will inevitably again be insufficient to meet most countries' full requirements.

Cobalt.—Thirty-five countries share 2,884 tonnes of which the U.S. receives 1,988 tonnes (+404) and the U.K. 360 tonnes (unchanged). The I.M.C. think that the supply position is likely to improve further in the early part of next year and will consider before the end of this year whether allocations should be continued in 1953.

Tungsten.—Free world production of tungsten in the fourth quarter is estimated at 4,957 tonnes compared with actual production of 4,690 tonnes for the third quarter of this year. Of this total the U.S. allocation of metal in concentrates amounts to 2,510 (—180) and the U.K. to 991 tonnes (unchanged).

Molybdenum.—Free world production for the fourth quarter is estimated at 5,680 tonnes compared to an actual third quarter production of 5,650 tonnes. The U.S. allocation of metal in concentrates amounts to 4,203 and for the U.K. to 420 tonnes (—about 200).

The I.M.C. stresses that despite increased production, the defence and stockpiling requirements both for tungsten and molybdenum are still in excess of production and re-emphasizes the importance of the measures already recommended by the Committee for conservation and substitution.

As in the third quarter any country's unused allocations of all five metals may be purchased by another country in addition to its own allocation.

The London Metal Market

(From Our Metal Exchange Correspondent)

There has been no special feature in the London Tin market this week, but the tone has remained firm. In the East the market has been comparatively steady. The R.F.C. announces that it has agreed to buy between 6,000 and 7,000 tons of Bolivian concentrates at 117½c. (U.S.) per lb. f.o.b. South American ports. It is understood that this is a spot purchase of an accumulation of a Bolivian production.

At the time of writing on the first day of the re-opening of the London Metal Exchange for dealings in lead, it can be reported that there was a very full attendance, and the turnover amounted to no less than 3,200 tons at the morning session. Business took place for October settlement, from £109 to £108, November £109 to £108, and January £111 to £108. The Government broker was called upon to supply only a small quantity for prompt delivery, which was negotiated at a price of £111. It appeared the producers' representatives were making hedge sales whilst there was, as expected, a fair consumer demand. We may remark that the general opinion at the end of the morning's business was that the London Metal Exchange has shown itself now, as in the past, quite capable of meeting any situation that would be likely to arise. The afternoon session on this first day was again fairly active with a turnover of 1,100 tons at prices somewhat lower with business from £108 down to £107 for most positions. No business transpired for prompt metal but the Government broker was a seller for this position at £112.

On Thursday the official close on the tin market was: Settlement price £968, Cash Buyers £967, Sellers £969; Three months' Buyers £955 10s., Sellers £966. In the afternoon the market was steady. Turnover for the day was 255 tons. Approximate turnover for the week was 705 tons.

The Eastern price on Thursday morning was equivalent to £981 per ton c.i.f. Europe.

On Thursday the official close on the lead market was: October Settlement—Buyers £99 15s., Sellers £100. January Settlement—Buyers £99 15s., Sellers £100. In the afternoon the market was steady. Turnover for the day was 2,125 tons. Approximate turnover for two days of this week was 6,425 tons.

Notes on the London Metal Exchange Lead Contract

There will be two markets each day, the official mid-day market and the unofficial afternoon market.

The market's times for dealing are as follows:

The official mid-day market first ring—12.10-12.20.

The official mid-day market second ring—12.40-12.45.

The unofficial afternoon market first ring—3.55-4.00.

The unofficial afternoon market second ring—4.15-4.20.

The new Lead Contract will be for the delivery of refined pig lead minimum 99.97 per cent purity of brands approved by and registered with the committee and in pigs weighing not more than 1 cwt. each. Duty (if any) for Buyer's account.

SETTLEMENT

- The Settlement date will be the last market day of the Settlement month.
- Contracts will be settled on exact quantities of 25 tons on the Settlement date at the official Settlement price fixed by the Committee on the market day immediately before the Settlement date, Buyer and Seller paying or receiving, as the case may be, the difference, if any, between the Settlement price and the contract price.
- Buyers and Sellers wishing to close their contracts by selling out or buying in (as the case may be) must do so not later than the close of the last session on the market day immediately preceding the Settlement date.

DELIVERY

Lead tendered in fulfilment of Settlement contracts will be invoiced at the Settlement price in parcels each of 25 tons or a multiple thereof (each 25 tons to be of one brand and to be treated as a separate contract). The lead to be delivered in Seller's option as follows:

- Ex-ship free into craft Thames between Nine Elms and Tilbury, both inclusive. Deliveries below Royal Albert Docks are subject to a deduction of "2s." per ton.
- Ex-wharf free into craft Thames or conveyance between Nine Elms and Tilbury, both inclusive. Deliveries below Royal Albert Docks are subject to a deduction of "2s." per ton.
- Ex-warehouse London, being a public warehouse approved by and registered with the committee.

Delivery shall be made on any day in Seller's option between the third market day of the month immediately following the Settlement month and the second market day of the second month following the Settlement month (both days inclusive).

Seller shall declare to Buyer not later than the fifteenth day of the month following the Settlement month and not less than three market days (including date of declaration) before date of delivery, brand, mode and place of delivery, stating in the case of:

- Delivery ex-ship, vessel's name (if known) and scheduled date of arrival. Vessel's name to be given to Buyer as soon as known by Seller.
- Delivery ex-wharf or ex-public warehouse approved by and registered with the committee, name of wharf or warehouse and date on which documents will be tendered.

PROMPT DELIVERY

Sales may be made for "prompt delivery." For the purpose of this contract "prompt delivery" means delivery in any of the following ways in Seller's option:

- (a) Ex-ship London free into craft Thames between Nine Elms and Tilbury, both inclusive, by steamer due to arrive within five market days of date of contract. Seller to give Buyer not less than three market days' notice in writing (including date of notice) of brand, vessel's name (if known) and scheduled date of arrival. Vessel's name to be given to Buyer as soon as known by Seller.
- (b) Ex-wharf, free into craft Thames or conveyance, between Nine Elms and Tilbury, both inclusive.
- (c) Ex-warehouse London, being a public warehouse approved by and registered with the committee.

In the case of (a) and (b) deliveries below Royal Albert Docks are subject to a deduction of "2s." per ton. In the case of (b) and (c) delivery shall be made on the third market day after the date of contract. Seller to give Buyer notice in writing on contract date of brand, mode and place of delivery, stating also the name of wharf or warehouse.

Contracts for prompt delivery shall be settled between Buyer and Seller and not through the official Settlement referred to above.

PAYMENT

Cash on presentation of documents. In the case of:

- (a) Delivery ex-ship Thames, cash against released Bills of Lading and Customs Entry, or Delivery Order issued or endorsed by Seller. Documents to be handed to Buyer in time to enable him to take delivery in due course of ship's unloading, but not before steamer has reported at the Custom House and has berthed. In cases of steamers where undue delay in delivery is probable, payment to be made against documents as soon as the lead is ready for delivery, but in such cases the Buyer must make application to the Seller for the documents in time to enable him to take delivery ex-ship.
- (b) Delivery ex-wharf Thames, cash against Delivery Order issued or endorsed by Seller.
- (c) Delivery ex-warehouse London, cash against Warehouse Warrant. Warrants shall be for 25 tons each (2 per cent either more or less) and each parcel of 25 tons shall be of the same brand and lie at one warehouse; rent shall be allowed on the invoice and not endorsed on the warrant.

In all cases where Delivery Orders are tendered, these shall be subject to Buyer's approval.

WEIGHING

Warrant weights, being those of a public warehouse approved by and registered with the committee, shall be accepted as between Buyer and Seller. In cases of deliveries otherwise than by Warrant, the Buyer shall furnish to the Seller as soon as possible and within thirty days of delivery certified lists of weightings, the parcel being kept intact and available for re-weighing. Settlement shall be made on the basis of the certified lists unless the weights are disputed by the Seller, in which case he shall have the right of re-weighing and of being represented thereat.

In the event of the Seller having been advised by the Buyer of a short weight, the Seller must give notice within three days of his intention of demanding a re-weight.

The re-weighing shall be done by a recognized independent weigher and shall be on a certified platform or beam scale, shall be final, and the cost thereof shall be borne by the party whose weights differ more than those shown when the metal is re-weighed.

DUES

All Port and/or Dock Dues, also London clause charges where levied to be paid by Seller.

Iron and Steel

The agitation for the abolition of the steel allocation system is gathering momentum. That there has been considerable maldistribution is not disputed, but the critics of controlled distribution base their claim for freedom, principally on the ground that steel supplies are becoming more plentiful. Ingot production is steadily rising and deliveries are running at a rate very much higher than last year. Moreover, it is expected that the bulk of the 1,000,000 tons of steel from U.S.A. will arrive between now and

the end of the year, whilst imports from the Continent amount in bulk to approximately thrice the imported tonnage in 1951.

The only cloud on the industrial horizon is the engineers' threat of a ban on overtime and piece work. If that threat be withdrawn the British steel industry will soon be booming and it is not improbable that a record rate of production will be attained before the end of the year. Two steel furnaces started this week at Colville's Clydebridge works are expected to raise the weekly ingot output by 2,000 tons a week, and elsewhere similar expansionist plans are in hand.

The disposal of increased outputs presents no difficulty. It is true that the export markets are relatively quiet. Up to the end of August the tonnage of iron and steel shipped abroad this year was about 200,000 tons below last year's figure. But home requirements are very heavy and at best cannot be overtaken for some months to come. Shipbuilders complain that the increase of 8 per cent in their allocations for the fourth quarter is not sufficient. In some quarters it is suggested that an increase in the order of 50 per cent is necessary. Generally, however, the supply position is a little easier and that improvement should be progressive.

One of the chief causes of the brightening outlook is the rapid expansion of pig iron production. Rather more home bought scrap is coming forward, but more blast furnaces are now in operation and the ratio of pig iron in the steel furnace mixtures has been increased. The assurance of ample supplies of coal has also given an impetus to the iron and steel industry and promises an ultimate conquest of the difficulties arising from the steel shortage.

OCTOBER 2 PRICES

COPPER

Electrolytic £285 0 0 d/d

LEAD AND TIN

(See our London Metal Exchange report for Thursday's prices)

ZINC

G.O.B. spelter, foreign, duty paid ... £122 0 0 d/d
G.O.B. spelter, domestic ... £122 0 0 d/d
Electrolytic and refined zinc ... £126 0 0 d/d
Special high grade ... £128 0 0 d/d

ANTIMONY

English (99%) delivered,
10 cwt. and over ... £225 per ton
Crude (70%) ... £210 per ton
Ore (60% basis) ... 20s. — 22s. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) ... £454 per ton

OTHER METALS

Aluminium, £157 per ton. Osmiridium, £35 oz. nom.
Bismuth, 17s. lb. Osmium, £70 oz. nom.
(min. 2 cwt. ex-warehouse). Palladium, £8 10s. oz.
Cadmium, (Empire) 14s. 4d. lb. Platinum, £27/£33 5s. nom.
Chromium, 6s. 6d. lb. Rhodium, £45 oz.
Cobalt, 20s. lb. Ruthenium, £30 oz.
Gold, 248s. f.o.z. Quicksilver, £64 10s.
Iridium, £65 oz. nom. ex-warehouse
Magnesium, 2s. 10½d. lb. Selenium, 25s. nom. per lb.
Manganese Metal (96%-98%) Silver 73d. f.o.z. spot and f'd.
2s. 2d./2s. 3d. per lb. d/d Tellurium, 18s./19s. lb.

ORES, ALLOYS, ETC.

Bismuth ... 60% 9s. 6d. lb. c.i.f.
50% 8s. 6d. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (lumpy) £14 2s. per ton c.i.f.
" (concentrates) £14 2s. per ton c.i.f.
" Refractory £13 14s. per ton c.i.f.
Baluchistan Metallurgical £15 8s. per ton c.i.f.
Magnetite, ground calcined £26 - £27 d/d
Magnetite, Raw ... £10 - £11 d/d
Molybdenite (85% basis) 105s. 10d. per unit c.i.f.
Wolfram (65%) ... 425s. c.i.f. U.K. buying
447s. 6d. d/d U.K. selling
Tungsten Metal Powder 31s. 7d. nom. per lb. (home)
(for steel manufacture)
Ferro-tungsten ... 28s. 7d. nom. per lb. (home)
Carbide, 4-cwt. lots ... £32 3s. 9d. d/d per ton
Ferro-manganese, home £49 0s. 8d. per ton
Manganese Ore U.K.
(48% - 50%) ... 6s. per unit
Brass Wire ... 2s. 9d. per lb. basis.
Brass Tubes, solid drawn ... 2s. 3½d. per lb. basis.

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

Market conditions were again quiet. Gilt-edged stocks kept up a steady recovery after last week's break but there was little excitement and institutional buyers were noticeably absent. At the end of the period the Government broker put in an appearance and some official support was reported for the first time for many months. The market was clearly being conditioned for the £972,000,000 funding operation just announced.

Rand shares and finance houses were generally little changed. The Anglo-American Corporation announced that they were maintaining the interim dividend at 20 per cent. Since last year, however, the capital has been increased by 623,950 new 10s. ordinary shares. The price of gold throughout the free markets of the world has recently been declining and informed circles abroad expect that this trend may continue. Much more newly mined gold is now coming on to the free markets owing to the relaxation of restrictions throughout the British Commonwealth. In addition, the rate of hoarding in the east has considerably slowed down now that the threat of war is considered to be further off.

The O.F.S. was one of the firmest sections, but even here activity was restricted. Some of the anticipated borehole and development results started to come in. President Brand announced that their W9 borehole had intersected the basal reef at 4,597 ft. giving a reef value of 1,207 in.-dwt. This caused a jump in the shares and a sympathetic movement in St. Helena as the borehole is situated not far from their eastern boundary. Harmony Gold's borehole L8R encountered the Basal reef at 5,044 ft. giving a value of 1,437 in.-dwt. Some market circles consider that this mine's development has been more regular than many others in this field and hope that the property may be out of the heavily faulted zone. The Loraine reef intersection of 350 in.-dwt. at a depth of 4,805 ft. in their No. 1 shaft caused little excitement. The water in the Free State Geduld shaft was still reported to be coming in on September 28.

Coppers were selectively firm. There was buying of Rhokana and Rhodesian Anglo-American ahead of anticipated dividend announcements. The latter company holds a 52 per cent interest in Rhokana. Both concerns should benefit from a full year's relief from U.K. tax. The buoyancy of the share prices was unaffected by news of a ban on overtime work by European miners following the breakdown of conciliation proceedings. Roan Antelope and Rhodesia Selection Trust both gave way following selling by holders tired by the absence of news concerning emigration.

Eastern tin shares remained steady with one or two strong features. Southern Kinta declared a final dividend of 25 per cent making a total of 50 per cent for the year as compared with 40 per cent last year. Sungei Kinta rose sharply following buying in a market short of stock.

From Bolivia comes news of the purchase of between 6,000 and 7,000 tons of tin by the United States. The Bolivian Government, however, had to hire a U.S. private organization to arrange the transaction. All efforts to obtain a long term contract failed. One of the big Bolivian mines is closing down in December due to the impossible conditions imposed upon it by the revolutionary government. This is likely to cause considerable unrest among employees and it is interesting to speculate how far it will effect Eastern tin issues if Bolivian production is curtailed.

Among other tin shares Beralts were again active but recorded little change over the week.

Lead/zinc issues fell following the lower price of £109 per ton recorded in the first day of free trading. Mount Isa exceptionally remained steady on copper production hopes.

Among miscellaneous base metals, Associated Manganese again came back on pessimistic rumours about this year's figures. There was again some profit-taking in asbestos shares which, however, closed above the lowest levels.

Dollar issues were mainly easier following dull trading conditions on Wall Street.

| FINANCE | Price | + or - | Price | + or - | MISCELLANEOUS GOLD | Price | + or - | TIN (Nigerian and | Price | + or - | |
|---------------------------------|--------|---------|--------------------------------|--------|--------------------|--------------------------------|--------|-----------------------|--------------------------------|----------|-------|
| | Oct. 1 | or week | | Oct. 1 | or week | | Oct. 1 | Miscellaneous) contd. | | or week | |
| African & European | 26½ | + | Freddies | 7/3 | + 3d | St. John d'El Rey | 26/- | + 6d | Geevor Tin | 13/6 | - 6d |
| Anglo American Corp. | 6½ | + | Freddies N. | 8/4½ | + 1d | Zams | 38/3 | + 3d | Gold & Base Metal | 3/4 | - 3d |
| Anglo French | 10½ | + | Freddies S. | 7/3 | + 3d | | | | Jantar Nigeria | 11/7½ | 4d |
| Anglo Transvaal Consol. | 28/3 | | F.S. Geduld | 2½ | + 3d | DIAMONDS & PLATINUM | | | Jos Tin Area | 10/1½ | - 1d |
| Central Mining (fl shr.) | 39/1 | + 80 | Geoffries | 16/- | - 3d | Anglo American Inv. | 4½ | | Kaduna Prospectors | 4/- | - |
| Consolidated Goldfields | 43/9 | | Harmony | 20/- | + 1d | Casto | 28/3 | - 3d | Kaduna Syndicate | 4/6 | - 3d |
| Consolid. Mines Selection | 25/7½ | | Cons. Diana | 20/- | + 6d | Cons. Diana of S.W. | 10/- | - 3d | Lombard Tin | 5/6 | - |
| East Rand Consol. | 28/3 | | Lydenburg Estates | 10/6 | | De Beers Deft. Bearer | 65/3xd | - 3d | United Tin | 1/9 | - 3d |
| General Mining | 10 | | Mariespruit | 4/- | - | De Beers Pld. Bearer | 15 | + 1d | | | |
| H.E. Prop. | 31/10½ | - 7d | Middle Wits | 15/7½ | - 1d | Pots Platinum | 9/3 | | LEAD, ZINC | | |
| Jameson's Transvaal | 10 | | Middle Wits | 15/7½ | - 1d | Waterfall | 15/- | + 1d | Bulwer Hill South | 50/- | - 6d |
| Johnnies | 2½ | + | President Brand | 22½ | + 2½ | | | | Burma Corporation | 1/9 | - 1d |
| Rand Mines | 38/4½ | | President Steyn | 19/7½ | | COPPER | | | Consol. Zinc | 28/9 | - |
| Rand Selection | 38/4½ | | St. Helena | 16/4½ | + 4d | Barberton | 60/9 | - 3d | Lake George | 15/3 | - 3d |
| Rand Transvaal Consol. | 28/3 | + | C.F.C. & G. | 14/4½ | + 10d | Esperanza | 4/4 | - 1d | Robb's Hill | 20½ | + 6d |
| Union Corp. (2/8 units) | 32/6 | + 7d | Virginia Road | 13/4½ | + 7d | Indian Copper | 4/4 | - | New Broken Hill | 25/6 | - 1d |
| Vereeniging Estates | 3½ | | Welkom | 24½ | + 1d | Mesina | 6/4 | - | North Broken Hill | 60/- | - 1/9 |
| Wits | 30/7½ | - 7d | Western Holdings | 3½ | + | Nchanga | 7½ | + | Rhodesian Broken Hill | 18/- | - 4d |
| West Wits | 42/9 | + 3d | | | | Rhob. Amalgamated | 30/- | - | San Francisco Mines | 31/- | - |
| | | | WEST AFRICAN GOLD | | | Rhob. Katanga | 15/6 | - 1d | Urwirwa | 4/10½ | + 7d |
| RAND GOLD | | | Amalgamated Banket | 1/9 | + 1d | Rhodesian Selection | 20/4½ | - 9d | | | |
| Blyvoor | 41/7½ | - 10d | Ariston | 6/3 | + 1d | Rhodesia | 24 | - 1d | MISCELLANEOUS | | |
| Brakpan | 31/3 | | Asbanti | 17/4 | + 1d | Rio Tinto | 25½ | - | BASE METALS & COALS | | |
| City De P. | 31/3 | | Bibani | 6/1½ | - | Rio Tinto | 25½ | - | Amal. Collieries of S.A. | 50/- | + 1/3 |
| Consol. Main Reef | 32/6 | | Breunang | 9/- | - 1d | Roan Antelope | 14/10 | - | Associated Manganese | 4½/- | - 2/3 |
| Crown | 40/- | + | G.C. Main Reef | 7/3 | + 3d | Selection Trust | 46/10 | + 1/6 | Cape Asbestos | 18/1 | - 4d |
| Daggas | 26/3 | + | G.C. Section Trust | 2/4 | + | Taaks | 62/9 | + 1/6 | C. Rand | 28/6 | - 6d |
| Duerofontein | 26/3 | + | Kougo | 7/4 | + | Tharisa Sulphur Br. | 45/- | - | Consol. Murchison | 30/- | - |
| Durban Deep | 30/8 | | Lyndhurst Deep | 2/4 | + | | | | Mashaba | 8d | - |
| E. Daggas | 26/3 | + | Marlu | 17/4 | + 1d | TIN (Eastern) | | | Natal Navigation | 3½ | - |
| E. Geduld (4/4 units) | 41/10½ | + 1d | Taqah & Abosso | 3/3 | | Aber Hittor | 8/9 | + 3d | Rhodesia | 15/- | - 3d |
| E. Rand Props. | 3½ | + | | | | Bangrin | 11/- | - | Turner & Newall | 90/- | - |
| Geduld | 8 | + | AUSTRALIAN GOLD | | | Gopeng | 6/7½ | - | Wankie | 17/9 | - 3d |
| Govt. Areas | 12/6 | | Boulder Perseverance | 2/3 | | Hongkong | 21/10½ | - 1d | Witbank Colliery | 2½ | + 1d |
| Grooteveld | 29/3 | | Gold Mines of Kalgoorlie | 10/3 | + 1d | Ipoh | 21/10½ | - 1d | | | |
| Libanon | 12/- | - | Great Boulder Prop. | 5/4½ | - 6d | Kamunting | 7/7½ | - | CANADIAN MINES | | |
| Luiipaards Vlei | 21/9 | - 6d | Lake View and Star | 16/3 | - 1d | Kepong Dredging | 12/1½ | - | Dome | \$39 | + 1/8 |
| Marievale | 20/- | - | Mount Morgan | 18/7½ | + 4d | Kinta Tin Mines | 7/7½ | - | Hollinger | \$31½ | + 1/8 |
| Marievale Consol. East | 22/6 | | North Kalgurlie | 12/6 | + 3d | Kepong Dredging | 23/9xd | - 3d | International Bay Mining | \$31½ | + 1/8 |
| New Kleinfontein | 28/10½ | - 7d | Song of Gwalla | 7/9 | - | Pahang | 9/9 | + 3d | International Nickel | \$84½ | - 1/8 |
| New Pioneer | 15/- | - 9d | South Kalgurlie | 7/9 | - | Pengkalen | 9/9 | + 3d | Mining Corp. of Canada | 7/8 | - |
| Randfontein | 23/3 | - 3d | Western Mining | 8/10½ | - | Petaling | 14/4½ | - | Noranda | \$159 | + 1/8 |
| Robinson Deep | 11/9 | - | | | Ramat | 12/6 | - | Quemont | 27/3 | - 1d | |
| Rose Deep | 23/9 | - | | | Siamese Tin | 28/9 | - | Yukon | 4/6 | - | |
| Simmer & Jack | 6/1½ | + 3d | MISCELLANEOUS GOLD | | | Southern Kinta | 16/- | + 4d | | | |
| S.A. Lands | 37/6 | | Cam and Motor | 40/7½ | S | S. Malayan | 27/-xd | - | OIL | | |
| St. John's | 7/4½ | - | Champion Reef | 6/6 | - | S. Trob. S. | 13 | - 1d | Anglo-Iranian | 5½ | - 1/8 |
| Stiftontein | 25/4½ | - 6d | Falcon Mines | 9/- | - | Sungei Kinta | 19/6 | - | Apex | 21/10½ | - 1d |
| Sub Nigel | 2½ | + | Globe & Phoenix | 2/4 | - | Tekka Talping | 24/- | + 3d | Attock | 43/- | - 1/3 |
| Van Dyk | 12/9 | - 3d | G.P. Rhodesian | 6/6 | - | Trobon | 24/- | - | Burmah | \$26 3/4 | - |
| Vereeniging | 16/9 | - 6d | Leont & Rhodesian | 2/4½ | + 1d | | | | Canadian Eagle | \$26 3/4 | - |
| Vlaakfontein | 18/9 | - | Motapa | 3/6 | - | TIN (Nigerian and | | | Mexican Eagle | 24/- | - 3d |
| Vogelstruifbult | 28/- | - | Mysore | 3/6 | - | Miscellaneous) | | | Shell (bearer) | 83/6 | - 6d |
| West Driefontein | 6½ | + | Nundvdroog | 5/6 | - | Amalgamated | 11/6 | + 4d | Trinidad Leasehold | 31/- | - 1/3 |
| West Rand Consolidated | 43/9 | - | Oroville | 11/3 | - | British Tin | 4/9 | - | T.P.D. | 21/10½ | - 3d |
| Western Reef | 43/9 | + 1/3 | | | | British Tin | 16/4½ | - | Ulramar | 28/10½ | - 2/4 |

COMPANY NEWS AND VIEWS

Siamese Tin's Record Earnings

The total yardage treated by Siamese Tin Syndicate in 1951 was approximately 1,000,000 cu. yd. below the previous year's throughput, due almost entirely to the dredge at Kota Bahru being out of action from the middle of March to the end of the year. But the loss of production which this entailed, a matter of some 41 tons, was approximately offset by increased output obtained from the company's properties in the Takuapa area and in the Renong district.

| Year | Per cu. yd. Dredged (000) | Yield (lb.) | Output (tons) | Per ton ore Price £ | Duty £ | Tin Ore Proceeds £ |
|------|---------------------------------|----------------|------------------|---------------------------|-----------|--------------------------|
| 1951 | 7,469 | 0.47 | 1,564* | 721 | 103 | 1,170,954 |
| 1950 | 8,470 | 0.40 | 1,525† | 572 | 89 | 948,003 |

*Excluding 61 tons recovered from tailings.

†Excluding 133 tons recovered from tailings.

Note.—The above results include operating returns from Kota Bahru, the company's Malayan subsidiary.

Although the company's total tonnage recovered, including the 61 tons recovered from the retreatment of tin shed tailings, showed a modest decline when compared with the tonnages recovered from all sources in 1950, the advance in the average price realized per ton of roughly £150 raised tin ore proceeds to a figure well above that achieved in the previous year. While this expansion in revenue was to some extent offset by an increase in mining costs of approximately £103,000, earnings before taxation at £489,335 represented an increase of more than £139,000 on 1950 and was, in fact, the highest achieved since the company's incorporation in 1906. U.K. taxation took much of the gloss off this impressive result, but nevertheless the company was able to distribute 25 per cent more than in the preceding year; allocate £25,000 (nil) to general reserve thereby raising that account's total to nearly £360,000; and transfer £28,000 (£20,000) to its employees' benefit fund without straining its resources. The lower carry forward figure was due to the distribution during 1951 of the special dividend of 50 per cent which the company intended to pay in respect of 1950 but was prevented from doing so before the accounts were closed because of the uncertainty caused by the proposed scheme for dividend limitation.

| Year | Mining Revenue £ | Mining Costs £ | Tax £ | Net Profit £ | Dividend % | Carry Forward £ |
|------|------------------------|----------------------|----------|--------------------|---------------|-----------------------|
| 1951 | 1,172,141 | 681,264 | 311,800 | 177,535 | 150 | 43,501 |
| 1950 | 949,664 | 578,637 | 213,262 | 143,382 | 125* | 76,466 |

*Including special interim dividend of 50 per cent paid during current year.

Concerning the mining venture which Siamese and Bangrin have under consideration, in the Leadhills and Wanlockhead area in Scotland, Mr. K. O. Hunter, who is chairman of both companies, said that for the last three months negotiations had been carried on designed to associate the Siamese Tin Syndicate group with other mining concerns of the highest reputation with whom the group could confidently proceed jointly to the development of this project. These negotiations, he declared, are progressing in a satisfactory manner, but at the time of the publication of the report and accounts were not advanced sufficiently far for him to give any further details, but he hoped "in the near future to present stockholders with a concrete proposition which will appeal to them."

No doubt the company is keeping a close watch on the London Lead Market. Certainly, the fall in the lead price in the last two days by about £23 to £108 per ton does not at first sight appear very encouraging. On the other hand, consumers have obviously held off making purchases in anticipation of free dealings and the current price reflects this wait-and-see attitude but does not mirror the big backlog of demand which has been built up whilst waiting for the return of a free market in the metal. Moreover, the U.K. price, which had been considerably higher than the Continental price, is now some £8-£9 lower, and also somewhat below the ruling price in the United States, even after allowing for import duties and shipping costs.

The technical reports, submitted at the Extraordinary General Meeting on July 4 last, dealing with the Leadhills-Wanlockhead mining venture considered it to be essentially a long-term venture and not one in which it was intended to exploit rapidly for a quick return of profits. Indeed, the long-term aspects were stressed in the technical report submitted by Mr. J. A'C. Berge, the joint managing director of the Siamese Tin Syndicate group, who advocated by implication the policy of gradual progress and consolidation.

While long-term forecasting is a hazardous occupation it is of interest to note that the Paley Report, dealing with the outlook for lead (see *The Mining Journal* of August 29, page 225), forecast that the projected primary lead consumption in the free world will have to increase, if requirements are to be met, by as much as 66 per cent by 1975.

Bangrin Tin Dredging Overcomes Difficulties.

The higher average value of the ground dredged by Bangrin Tin Dredging during 1951 enabled the company to overcome the handicap of having to forego the services of one of its three dredges for the last three months of the year.

| Year | Per cu. yd. Dredged (000) | Yield (lb.) | Output (tons ore) | Per ton ore Price £ | Duty £ | Tin Ore Proceeds £ |
|------|---------------------------------|----------------|----------------------|---------------------------|-----------|--------------------------|
| 1951 | 3,423 | 0.72 | 1,098* | 710 | 108 | 803,783 |
| 1950 | 3,689 | 0.67 | 1,101† | 558 | 108 | 627,777 |

*Excluding 34 tons recovered from tailings.

†Excluding 24 tons recovered from tailings.

To put the operating results, shown in the table below, in their proper perspective, it should be realized that until the end of September, 1951 the company's three dredges were in full operation, two dredges, Nos. 1 and 3 working in the relatively rich Sydney-Siam area and No. 2 dredge working on the Bangrin Plain. This latter area, however, had been dredged since 1923 and although it yielded 153 tons of tin ore during the nine months in which it was worked by the No. 2 dredge the life of this area, as anticipated, came to an end on September 29, 1951. Nos. 1 and 3 dredges operating in the Sydney-Siam area, which has an estimated life of approximately two years, increased their total throughput during the year and although the output from No. 1 dredge declined from 534 tons to 402 tons, output from the No. 3 dredge advanced to 543 tons compared with 364 tons in 1950. Moreover, the price received per ton tin ore improved by some £150 per ton, with the result that tin ore proceeds show substantial expansion over the corresponding figure for 1950.

| Year | Mining Revenue £ | Mining Costs £ | Tax £ | Net Profit £ | Dividend % | Carry Forward £ |
|------|------------------------|----------------------|----------|--------------------|---------------|-----------------------|
| 1951 | 803,783 | 391,892 | 272,730 | 132,903 | 70* | 31,274 |
| 1950 | 627,777 | 333,400 | 192,462 | 126,546 | 50* | 56,371 |

*Including special interim dividend of 10 per cent paid during current year.

Mining costs were higher, largely owing to wage increases, higher maintenance and fuel charges, but even so the profit before tax of £405,633 represented an increase of £86,625 over the previous year's earnings and was a record for the company. Unfortunately, the tax attracted was also something of a record and the net available surplus after tax was only modestly higher than the previous year. Shareholders participated in the better results, receiving 70 per cent (50 per cent) which required a total net amount of £110,250 compared with £66,000 in 1950. The sum of £20,000 was allocated to general reserve, bringing that account up to over £85,000 and £12,000 (£10,000) was transferred to the company's employees benefit fund, leaving £31,274 to be carried forward against £56,371 brought in. In this connection, it should be noted that the lower forward balance was due to the same reasons advanced in the note on Siamese Tin.

Prospects for the current year have been somewhat marred by the loss of No. 2 dredge and by the necessity to place the No. 3 dredge in dry-dock for repairs to its hull plates. Production for the first eight months of the current year has fallen to 380 tons compared with 702 tons in the corresponding period of 1951.

However, the No. 3 dredge is now back in commission, and the monthly production figures which, since April last, have been averaging less than 40 tons should henceforth begin to increase substantially.

Kolar Goldfield Group in 1951

Although the four gold producing companies on the Kolar Goldfield were incorporated in India on December 27, 1950, owing to the delay in settling certain legal matters connected with the transfer of assets in Mysore of the Sterling companies, it was not until April 1, 1951, that the Indian incorporated companies took over those assets and commenced operations. As the re-constituted boards wished to continue the practice of the former U.K. registered companies of terminating their financial year on December 31, the accounts were closed on that date and those now presented cover the nine month period ended December 31, 1951. In this connection, the boards of the respective companies felt that no useful purpose would be served by showing comparative figures as the previous period covered fifteen months' operations to March 31, 1951.

| Nine months Dec. 31, 1951 | Champion to Reef G.M. of India (K.G.F.) | Mysore G.M. (K.G.F.) | Nundydroog Mines (K.G.F.) | Ooregum G.M. of India (K.G.F.) |
|---------------------------------|--|----------------------------|---------------------------------|---|
| Milled ... (tons) | 130,760 | 146,300 | 157,050 | 93,723 |
| Grade ... (dwt.) | 8.30 | 6.73 | 5.14 | 5.08 |
| Yield (oz.) | 54,273 | 49,241 | 40,381* | 23,818 |
| Gold Sales (Rs.) | 1,60,30,457 | 1,45,03,234 | 1,22,76,767 | 70,93,603 |

* Including gold recovered from old tailings.

Generally speaking, the operating results shown in the above table for each of the four companies were at a higher rate during the nine months period under review than when the mines were being worked by the former Sterling companies. However, the average price received for each of the companies' gold output was lower than during the previous fifteen month period and varied between Rs.5 per oz. lower for Ooregum to Rs.8 per oz. lower for Mysore. Moreover, the chairman of the four companies, Mr. M. A. Sreenivasan, states that since the end of 1951 there has been a further very substantial fall in the gold price, which, he added, must inevitably have a serious effect upon each of the companies' earnings, and in the case of Ooregum, he said that because of this downward movement there was little prospect that any dividend would be distributed in the current year.

| Nine months Dec. 31, 1951 | Champion to Reef G.M. of India (K.G.F.) Rs. | Mysore G.M. (K.G.F.) Rs. | Nundydroog Mines (K.G.F.) Rs. | Ooregum G.M. of India (K.G.F.) Rs. |
|---------------------------------|---|-----------------------------------|--|--|
| Gross revenue | 1,52,78,821 | 1,38,21,893 | 1,17,07,167 | 67,84,714 |
| Working profit | 45,93,991 | 28,82,959 | 16,82,441 | 7,10,231 |
| Taxation | 25,43,228 | 10,51,123 | 5,93,177 | 2,21,146 |
| Dividend | 15% | 4½% | 4½% | Nil |

The report and accounts of the holding companies are presented together with those of their wholly-owned operating subsidiaries, and conform to the same pattern. They present the results for the nine months ended December 31, 1951, and with the authority of the Board of Trade, comparative figures for the previous financial period, are omitted as the companies ceased to be actively operating from April 1, 1951.

The report and accounts of the Champion Reef Gold Mines of India for the nine months ended December 31, 1951, show that gross revenue amounted to £49,779. Taxation absorbed £15,074, the sum of £22,456 was allocated to general reserve and after paying a first and final dividend at the rate of 10 per cent, which required £32,500, there remained to be carried forward £5,678.

The report and accounts of the Mysore Gold Mining Co. reported a gross revenue of £29,153. Taxation absorbed £8,496 and after paying a first and final dividend for the nine months ended December 31, 1951, at the rate of 3½ per cent, which absorbed £21,350, the carry forward was £4,717.

The gross revenue as shown in the report and accounts of Nundydroog Mines for the nine months period amounted to £14,344. Taxation called for £4,001 and after paying a first and final dividend in respect of this nine month period at the rate of 3½ per cent, absorbing £9,905, the balance to be carried forward was £621.

The gross revenue of the Ooregum Gold Mining Co. of India was recorded in the report and accounts for the nine months period at £1,023. Taxation took £330. No dividend was paid, leaving the balance to be carried forward at £1,633.

"West Africans" Show Mixed Results in August

Six of the ten West African gold producers shown in the table below end their financial year in September. Thus the August mine returns, together with the cumulative totals to date and those of the corresponding period of the previous year, provide a rough guide as to what may reasonably be expected in the full year.

On this rough and ready basis, only Ariston and Marlu appear likely to report better year-end total profits. Ariston announced one of the highest monthly throughputs and gold output in the last two years, and profits are running well ahead of last year. Marlu was also able to produce a good return, the profit figure shown being the best since last November.

Of the other companies whose financial year ends in September, Konongo may close the gap between this year's and the preceding year's profit to negligible proportions, but this task seems to be beyond the capabilities of the remainder in this category.

Ashanti returned to its usual monthly crushing figure of 20,000 tons after the settlement of the strike last month which kept the July profit down to approximately £52,000. Bremang Gold Dredging, with eight months of its financial year already gone, is feeling the effects of not having its No. 2 dredge in operation.

| Company | August, 1952 | | | No. of Months | Current Financial Year | | | No. of Months | Last Financial Year | | |
|-------------------|--------------|-------------|-----------------|---------------|------------------------|-------------|-----------------|---------------|---------------------|-------------|-----------------|
| | Tons (000) | Yield (oz.) | Profit* (£,000) | | Tons (000) | Yield (oz.) | Profit* (£,000) | | Tons (000) | Yield (oz.) | Profit* (£,000) |
| A.B.A. | 57 | 8,774 | 13.7 | 11 | 569 | 93,640 | 217 | 598 | 85,129 | 280 | |
| Ariston Gold | 28 | 10,350 | 56.7 | 11 | 302 | 105,235 | 512 | 300 | 94,206 | 494 | |
| Ashanti | 20 | 14,500 | 81.1 | 11 | 304 | 151,890 | 771 | 217 | 175,318 | 981 | |
| Bibiani | 31 | 5,765 | 10.7 | 11 | 330 | 64,756 | 154 | 322 | 68,272 | 194 | |
| Bremang | 521 | 1,835 | 17.4 | 8 | 4,827 | 23,500 | 122 | 5,798 | 26,927 | 145 | |
| G.C.M.R. | 9 | 3,027 | 7.0 | 2 | 17 | 6,045 | 14 | 17 | 5,773 | 18 | |
| Konongo | 3 | 2,278 | 9.9 | 11 | 27 | 24,051 | 109 | 35 | 26,266 | 111 | |
| Marlu Gold | 42 | 3,660 | 14.3 | 11 | 436 | 41,084 | 91 | 433 | 39,176 | 81 | |
| Nanwa Gold | 3 | 695 | N/A | 8 | 22 | 5,559 | N/A | 18 | 2,542 | N/A | |
| Taouah and Abosso | 21 | 4,753 | 110.5 | 5 | 105 | 23,765 | 149 | 105 | 25,648 | 25 | |

* Including premium revenue since November, 1951. As the basis of calculating monthly profit varies from company to company a direct comparison one with another is not possible. The basis for any one company has, however, remained consistent, unless otherwise indicated.

‡ Ore treated given in cu. yd. L indicates a loss.

Gold Coast Main Reef is making steady progress; but while the total throughput and yield during the first two months of the current year show up better than the results of the corresponding period in the preceding year, rising costs have taken the edge off this improvement. Amalgamated Banket Areas is in much the same position; gold output is well ahead but total profits do not compare with last year's figure.

AUGUST TINS OUTPUT IN TONS OF TINS CONCENTRATES

| Company | Aug. | | Financial Year to Date | | Company | Aug. | | Financial Year to Date | |
|----------------|----------------------|----------|------------------------|------|----------------|----------------------|----------|------------------------|------|
| | Month since year end | Year end | This | Last | | Month since year end | Year end | This | Last |
| EASTERN | | | | | NIGERIA | | | | |
| Ampat | 46 | 8 | 692 | 624 | Amal. Tin | 443 | 5 | 1774 | 1792 |
| Bangrin | 37 | 8 | 380 | 702 | Amal. Tin | 35* | | 169 | 102 |
| Batu S. | 20 | 11 | 262 | 182 | Bisichi | 32 | 8 | 381 | 428 |
| Berjantai | 79 | 4 | 308 | 210 | Bisichi | 9* | | 111 | 110 |
| Jelapang | 53 | 8 | 211 | 206 | Ex-Lands | 52 | 8 | 381 | 386 |
| Kampong | 27 | 5 | 123 | 198 | Filani | 10 | 5 | 53 | 32 |
| Kamunting | 176 | 5 | 982 | 1111 | Jantar | 27 | 11 | 236 | 242 |
| Kinta | 15 | 5 | 59 | 66 | Jantar | 18* | | 194 | 213 |
| Kinta Tin | 21 | 8 | 188 | 256 | Jos | 14.5 | 1 | 14 | 12 |
| Klang River | 37 | 5 | 157 | 143 | Kaduna P. | 15 | 5 | 54 | 41 |
| Kramat Tin | 30 | 5 | 143 | 173 | Kaduna S. | 27 | 8 | 155 | 164 |
| Kualar K. | 140 | 5 | 808 | 923 | Keffi | 33 | 5 | 106 | 85 |
| Kuchai | 106 | 11 | 757 | 669 | N'guta Ex. | 10 | 8 | 55 | 67 |
| Larut | 48 | 8 | 533 | 612 | N'guta K. | 13 | 8 | 80 | 103 |
| Lower Perak | 74 | 4 | 313 | 288 | N'guta T. | 23 | 8 | 202 | 159 |
| Malaysia | 7 | 5 | 26 | 27 | N'guta T. | 3* | | 37 | 36 |
| Pahang | 220 | 1 | 220 | 240 | Ribon | 9 | 5 | 32 | 21 |
| Rahman | 25 | 2 | 68 | 109 | Rukuba | 1.5 | 5 | 8 | 41 |
| Rantau | 73 | 2 | 132 | 53 | S. Bukuru | 5 | 5 | 38 | 46 |
| Rawang Con. | 39 | 5 | 233 | 269 | Tin Fields | 1.75 | 5 | 8 | 10 |
| Rawang Tin | 35 | 5 | 373 | 523 | U. Tin | 11 | 2 | 21 | 20 |
| Remong | 25 | 2 | 48 | 160 | | | | | |
| S. Kinta | 119 | 8 | 949 | 930 | Beralt | 13 | 5 | 58 | 21 |
| S. Kinta | 392 | 5 | 2025 | 1117 | Beralt | 188† | | 936 | 927 |
| Tambah | 17 | 8 | 85 | 137 | Gecvor | 25 | 5 | 230 | 305 |
| Tanjong | 67 | 8 | 714 | 841 | S. Crofty | 38 | 8 | 295 | 192 |
| Tongkah | 82 | 2 | 147 | 98 | S. Crofty | | | 14† | 3† |

* Columbite. † Wolfram.

NORTH KALGURLI (1912) LTD.

The Annual General Meeting of North Kalgurli (1912) Ltd., was held on Wednesday last at Winchester House, London, E.C.2.

Mr. C. T. Ley (chairman), who presided, in the course of his speech, said:

You will notice that the proceeds of ore treated are some £5,000 more than the previous year, but to arrive at this result the cost has been some £95,000 greater; almost as much as the entire capital of the company. This large increase in operating costs has been due mainly to higher wages, increased maintenance and material charges, etc.; in fact, everything has risen in price except the official price of gold. Surely this price can no longer be justified. Recently, however, permission has been granted to gold producers to sell the whole of their gold for dollars, and so far the result has been quite satisfactory. A company called the Gold Producers' Association was formed to deal with this and you will be glad to know that our General Manager, Mr. A. A. McLeod, is a Member of the Executive Committee. Only a small amount from this source is included in the accounts under review, but I hope that next year we shall find that it has made considerable difference to our profits.

After deducting some 60 per cent for payment of taxes, we are faced with the task of providing such sums as are required to keep the mine up to date and at the same time provide an adequate dividend for our shareholders.

To turn to the balance sheet, you will notice a small profit of £1,471 appears as a surplus on sale of investments. In order that there shall be no misunderstanding, I wish to say that this was for some mining shares taken over from Oroya Links Ltd. in 1928 and which have been unsaleable from then until quite recently. I should like it to be quite understood that this company does not and never has invested its funds in the share market.

You will notice that it has been necessary to reduce the amount of our ore reserves by 131,779 tons. Increased operating costs bring this amount of tonnage below the margin of payability. This is one more evil effect which inflation is having on Australian economy. Our total ore reserves are now estimated at 2,183,162 tons of an average of 5.62 dwt. against 2,314,941 tons averaging 5.53 dwt. in 1950. The tonnage treated was 251,743 tons of a grade of 5.066 dwt. per ton, 7,600 tons more than the previous year, the total tonnage being divided about equally between the two shafts.

Footage drilled during the year, chiefly in the Kalgurli section, was lower at 13,200 ft. against 13,648 the previous year. The programme undertaken in connection with the recommendation of our consulting geologist is now nearly complete.

Financially, diamond drilling does not of course produce any immediate result, but appreciation of its value when it comes to driving can be obtained from our General Manager's Report where he mentions that, on No. 5 Level in the Birthday South Lease Section E.10 South to C.14 South, an orebody originally located by diamond drilling was developed over a total length of 481 ft. of fluctuating values, but with an average assay over the entire length of 3.9 dwt. over 72 in. in width.

The new shaft has been completed and has been in commission since August 1. Recent operations have been mainly centred round the new shaft. As an engineering feat it is a splendid piece of work. The estimated time for the completion of the programme was two years. Actually it took rather longer, but was a fine performance when the difficulty in securing the necessary machinery and equipment is realized.

The new shaft is situated about 100 ft. south-east of the existing North Kalgurli shaft and is the approximate centre of gravity of the company's 2,000,000 ore reserves. The new shaft will improve working conditions in the mine by permitting a greater use of mechanized equipment facilitating service supply and ventilation. This will be the largest shaft on the Golden Mile.

Let me give you an instance of the saving in costs in one direction alone. The old winder at the Kalgurli shaft is worked by steam, which is very expensive. When this is replaced by the new shaft, I understand that there will be an immediate saving of £400 a month from this source alone.

With the coming of the new shaft the chief interest lies in the development of the North Kalgurli East Lodes. By opening up the levels below the No. 8 North Kalgurli level, which up to now has been the lowest level, we hope to add considerably to our ore reserves and obtain access to large bodies of ore not available at present. In the Kalgurli Section, orebodies exposed by diamond drilling will be developed, and an endeavour made to locate the downward extension of the N.E.D. lode.

The Oroya North Block will be subjected to some intensive diamond drilling, possibly by moving the North Kalgurli headgear to the Pomeroy shaft. Should this exploration produce good results, it will be simple to connect up with one of the main haulage levels and have the ore transported to the new shaft for hoisting. With all this before us, there still remains the Croesus Proprietary Mine and the United Leases to be opened up. This will probably have to wait until further treatment facilities are made available, and this is the chief reason for my coming visit to the mine.

The report and accounts were unanimously adopted.

FREE STATE DEVELOPMENT AND INVESTMENT CO., LTD.

The Annual Meeting of the Free State Development & Investment Corporation Ltd., was held on September 25 in the Board Room, Consolidated Building, Johannesburg.

In the absence of the chairman, Mr. Kenneth Richardson, Mr. D. A. B. Watson presided and, in his address to shareholders, said in part:

The extent of the company's prospecting activities during the year, and subsequently, has progressively been reduced. Drilling operations are now being carried out in only two areas, the first to the west of and immediately adjoining the property of Freddie's North Lease Area Ltd., and, the second, on what is known as the Whites Block, near the town of Hennenman, situated some seven miles north-east of the Virginia mine.

In so far as the area adjoining the property of Freddie's North Lease Area Ltd., is concerned, borehole E.R.K.1 was being drilled at the end of the year with a view to proving whether the conglomerates known as the "Rainbow" Reefs, which occur in the neighbourhood of the farm Van den Heever's Rust, extend southwards into the farm Energie 896, over a portion of which farm your company holds the mineral rights. Since the end of the year certain intersections of this reef were made in that borehole, and the values obtained have already been published in the Press. The most significant of these were: At 4,365 ft., 9.7 dwt. over 17.5 in., equivalent to 170 in.-dwt., and at 4,949 ft., 22.7 dwt. over 44.3 in., equivalent to 1,006 in.-dwt. At a depth of 5,560 ft., the "B" Reef was intersected and gave a value of 11.0 dwt. over 23.5 in., equivalent to 258 in.-dwt. The Basal Reef was faulted out, and a deflection which was made in an endeavour to intersect that reef failed to do so. Further deflections are now being made near the horizons at which the "Rainbow Reefs" were found.

WHITES BLOCK

With regard to the Whites Block, it was reported last year that in this area intersections of the "A" Reef indicated values which, although only moderate, were sufficient to justify further exploration. Since that time, however, drilling has not disclosed any significant values on this reef.

In borehole B.S.1, on the farm Brooklands 433, which was commenced and completed after the close of the year, the "A" Reef was intersected at a depth of 1,634 ft. and assayed 0.9 dwt. over a true width of 22 in. In a deflection the "A" Reef was intersected at a depth of 1,632 ft. and assayed 1.3 dwt. over a true width of 17.5 in. In the deflection a further narrow conglomerate in the "A" Reef horizon was intersected at a depth of 1,635 ft., assaying 2.5 dwt. over a width of 13 in.

Borehole V.V.2 on the south-eastern corner of Portland 26, and on the boundary of Ventersvlakte 349, failed to intersect the "A" Reef on account of faulting.

Borehole R.R.1 on the boundary of Rietspruit West 364 and Rietspruit 293 was commenced subsequent to March 31, 1952, and this hole, too, failed to intersect the "A" Reef owing to faulting.

Unless the results in further boreholes are more encouraging than those obtained up to the present time, the exploitation of this Block under present-day conditions would be unlikely.

In addition to the drilling operations to which I have referred, prospecting is being done for lime in the Kroden Block. Should this investigation be unsuccessful, the options in this area will be abandoned. The lime deposit, if any, is unlikely to be of material significance to your company.

As stated in the directors' report, certain options held by this company over considerable areas in the Zand River, Hennenman, Kroonstad, and Bothaville Blocks were abandoned during the year under review.

In the Zand River area it is known that coal underlies some of the farms over which this company held options to purchase the mineral rights, but the quality of the coal, and the depth at which it was encountered in drilling, rendered it unattractive.

After the end of the financial year, it was decided that the options over the remaining portion of the Hennenman Block should all be abandoned, as and when they fall due, owing to the indifferent results obtained in drilling to the east of the Whites Block.

Excluding the Hennenman and Bothaville Blocks, which are to be abandoned, your company at present holds prospecting contracts over some 3,542 morgen, in the following two areas:

Kroden Block: 2,809 morgen (being prospecting for lime).

Whites Block: 733 morgen (being prospecting for "A" reef).

In addition to the aforementioned area of 733 morgen being prospecting in the Whites Block, your company has certain agreements in respect of the mineral rights over an area totalling 1,799 morgen in the same Block.

MINERAL RIGHTS

After the close of the year, it was decided to purchase the mineral rights over certain farms immediately south of the Vaal River, in extent approximately 983 morgen. Including this area, but excluding 7,654 morgen which have already been incorporated into mining leases ceded to other companies, your company at the

moment holds the mineral rights over areas totalling some 11,864 morgen.

It is hoped that from time to time certain of these mineral rights will be turned to account.

FREDDIES NORTH AND SOUTH

Your company's main shareholding is in Freddie's North Lease Area Ltd., and Freddie's South Lease Area Ltd., which mines are now in the developing stage.

In the last quarterly reports issued by these two companies, it was stated that the major portion of the development work is being undertaken in the footwall of the reef with a view to arriving at the positions for the reef rises as quickly as possible, and consequently the footage reported on reef was negligible.

The quarterly reports also referred to the fact that construction work on the reduction plant and other surface works was proceeding according to plan and was well advanced. The chairman in his speech to shareholders on May 21, 1952, indicated that it was hoped that production on these two mines might commence early in 1953.

The report and accounts were adopted.

HARMONY GOLD MINING CO., LTD.

(Incorporated in the Union of South Africa)

AUTHORIZED CAPITAL (in shares of 5s. each) £3,750,000
ISSUED CAPITAL £3,400,000

Summarized Receipts and Expenditure down to June 30, 1952, extracted from the Report and Accounts for the year ended June 30, 1952.
Net Capital Receipts £7,044,757
Expenditure 3,911,025

Less Shares, Stores and Materials, Debtors, etc. 3,133,732
455,403

Net Cash Position £2,678,329

Chairman's Statement accompanying the Report and Accounts:

"Further confirmation of the prospects of the company was obtained during the year from boreholes L.R.5, L.R.6 and L.R.7, which were drilled to the north of the Harmony lease area by New Consolidated, Free State, Exploration Co. Ltd. Apart from the values disclosed, which averaged 801 in.-dwt., these three boreholes are important as they indicate that the Basal Reef probably underlies nearly the whole of the Harmony lease area. Sinking operations at No. 3 Shaft averaged 200 ft. per month during the year, while at the Ventilation Shaft the monthly average was 204 ft. Bearing in mind the difficult sinking conditions, progress in both shafts was very satisfactory, the total depth of the Ventilation Shaft at June 30, 1952, being 4,277 ft. and that of No. 3 Shaft being 3,759 ft.

Steady progress was made on the surface, including the completion of 43 permanent houses for European employees, the erection of various buildings, such as shaft offices, workshop and storage shed, the improvement of water and electricity supplies, the building of a cooling dam and the making of roads and planting of trees. As the demand for housing will become greater when underground development commences early next year, the programme of European housing is being accelerated and the Native hostel is being extended. It is expected that all future houses for Europeans will be built in the Harmony suburb of the proposed Virginia Township, which is being laid out by Virginia Land & Estate Co. Ltd. This company has a substantial interest in the Township Co. and the closest co-operation is maintained with it, as well as with the two other mining companies in the Sand River area, in order to co-ordinate development of the proposed township. Although good progress has been made with the laying-out of the town of Virginia, it is not expected that it will be finally proclaimed as such for another two years.

After the close of the financial year the Ventilation Shaft, which is about 900 ft. from borehole H.1, intersected the Leader Reef at a depth of 4,335 ft. below the collar. Sampling at 5 ft. intervals round the perimeter of the shaft gave an average value of 1.06 dwt. over a channel width of 50.4 in., equivalent to 53 in.-dwt. The shaft intersected the Basal Reef at a depth of 4,364 ft. below the collar. Sampling at 5 ft. intervals round the perimeter of the shaft gave an average value of 10.08 dwt. over a channel width of 47.4 in., equivalent to 478 in.-dwt. The Basal Reef was stopped out for a distance of approximately 15 ft. round the shaft to facilitate the removal at a later date of the shaft pillar. The resulting reef face was sampled at 5 ft. intervals, the average value being 15.4 dwt. over a channel width of 45.6 in., equivalent to 702 in.-dwt. Seventeen sections of Basal Reef were sampled in the shaft, while a further 35 were sampled on the face of the stoped-out area. Of the total of 52 sections, only one gave an unpayable result. The consistency of good values, together with the robust appearance of the reef, are encouraging features which give cause for satisfaction. The Ventilation Shaft is now being sunk to its final depth of approximately 4,725 ft. below the collar. A station and ore passes will be cut and the shaft will be equipped for hoisting men, material and ore. Development on reef will be commenced probably during the first quarter of next year. Work on the connections to be established with No. 3 main hoisting shaft, about 4,300 ft. to the west, will be pressed forward with all possible speed. The dip of the formation disclosed by the reef intersection is at an angle of approximately 9° in a westerly direction.

Work is in progress on the excavations for the first unit of the reduction plant, which will have an initial milling capacity of 45,000 tons a month. The company continued to operate on loan facilities until March, 1952, when an amount of £5,180,000 was raised by the issue of 5,000,000 new shares at 18s. 6d. each. The loans, together with interest thereon, were then repaid, and at the end of the financial year the company's net cash position was £2,678,329. It is expected that this amount will finance operations at the property until the middle of 1953, after which it will be necessary to make fresh financial arrangements to enable work to be carried on to the production stage."

The full Report and Accounts may be obtained from the London Secretaries, A. Moir & Co., 4 London Wall Buildings, London, E.C.2.

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DECLARATION OF DIVIDEND No. 32 ON THE ORDINARY SHARES

NOTICE IS HEREBY GIVEN that Dividend No. 32, equal to 2s. per share, has been declared as an interim dividend in respect of the year ending December 31, 1952, payable to shareholders registered in the books of the Corporation at the close of business on October 14, 1952, and to persons presenting Coupon No. 35 from Share Warrants to Bearer.

The dividend is declared in the currency of the Union of South Africa and becomes due on October 15, 1952. Warrants will be posted from the Head and London Offices of the Corporation on or about November 13, 1952.

The dividend is payable subject to the usual conditions, which can be inspected at the Head and London Offices of the Corporation.

The Ordinary Share Transfer Books and Register of Members will be closed from October 15 to October 22, 1952, both days inclusive.

Holders of Share Warrants to Bearer are notified that the dividend is payable at Barclays Bank (Dominion, Colonial and Overseas), Circus Place, London Wall, E.C.2 or at the Banque de l'Union Parisienne, 6 and 8, Boulevard Haussmann, Paris, on or about November 14, 1952. Coupons must be left four clear days for examination.

The effective rate of Non-Resident Shareholders' Tax is 6.075 per cent.

By Order of the Board,
W. E. GROVES,

London Secretary.

LONDON OFFICE:
11, Old Jewry, E.C.2.
September 29, 1952.

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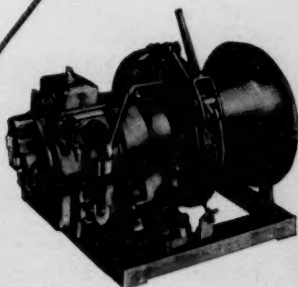
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